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AVIATION SAFETY LETTER

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Learn from the mistakes of others;
you'll not live long enough to make them all yourself ...

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GUEST EDITORIAL

Justin Bourgault

Quebec Region

Like the rest of Canada, the Quebec region is quite vast, and aviation is very important since it provides a fast and reliable means of covering long distances. The aviation sector is an essential element in Canada's economy and transportation network. Whether for business, pleasure, exploration, or to provide remote communities with essential services, air transport is often the most efficient way to travel and transport commodities and equipment. In some cases, such as in the case of northern regions, it is the only way.

Hydroelectric projects on the lower North Shore as well as the boom in the mining industry in northern Quebec have lead to a significant increase in air traffic in these regions. This rapid growth has put pressure on infrastructures; however, it is important to remember that safety comes before profitability. Our air safety plan ranks among the best in the world, and in order for it to stay that way, cooperation between all aeronautic industry stakeholders is necessary.

The world is constantly evolving and aviation is no exception. Think of the advent of global positioning systems (GPS) which now allow us to conduct approaches at almost the same minima as those of instrument landing systems (ILS) at airports where such a thing was inconceivable only a few years ago. Lighter and more resistant material now allow for aircraft designs which are quieter, have better fuel range, can carry a higher pay load and use shorter runways. Automatic dependent surveillance-broadcast (ADS-B) technology now allows air traffic controllers to "see" aircraft, even in the most remote areas, without the help of radar equipment. These are only a few examples, but they clearly demonstrate that we are in a state of constant change.

It is not only the industry that has to adapt in this ever-changing environment. Transport Canada has also modified their organizational structure in order to put the focus on the corporate sector. This reorganization began in the spring of 2011 and is now almost complete in our region. All work descriptions and their classifications had to be reviewed which proved to be a much more complicated task than anticipated. However, the work is on track for completion at the end of March 2013.

To wrap up this overview, I would like to emphasize that the aviation sector continues to see major growth, and that technology and regulations alone will not be able to improve the level of safety in the industry. All industry stakeholders must continue to work together to encourage a stronger safety culture at all levels.

Justin Bourgault

Justin Bourgault
Regional Director, Civil Aviation
Quebec Region

PRE-FLIGHT

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COPA Corner: In Sync Climb Recovery

by Alexander Burton. This article was originally published in the September 2012 issue of COPA Flight *magazine and is reprinted with permission.*

"Your attitude, not your aptitude, will determine your altitude."
– Zig Ziglar

One of the most basic and yet illusive skills we learn as pilots is to climb to a specified altitude, level off, and maintain the altitude.

As flight instructors and pilot examiners, we see this skill in all its various forms on pre-solo check rides, private pilot, commercial pilot, multi-engine pilot and instrument pilot flight tests and check rides. Indeed, I've watched it in my own performance.

On my last instrument check ride, while climbing, turning, switching frequencies and glancing, oh so briefly, down at the SID plate, I blew right through my assigned altitude, gaining an unwanted, extra 80 ft before pushing the nose down and recovering in a fairly undignified manner.

I suspect climb recovery is not one of those skills we, as instructors, teach extremely well. Somehow, many of us seem to think that a 15 second lesson including the acronym APT (attitude, power, trim) does the job. Apparently, not quite as well as we might hope.

Whether you fly "on the gauges", as my friend Todd would say,[1] or while looking outside enjoying the miracle of flight as the good lord intended, learning to recover properly from a climb is actually a fairly complex manoeuvre and understanding the process and the inherent dynamics pays off in the long term.

For those pilots who have mastered this basic skill to a state of consistent excellence: good for you. For the rest of us mortals, a little review of this complex process can't hurt and might just do some good.

Right off the bat, an airplane climbs on excess thrust: climb is the result of the propulsion system producing more thrust than that required for level flight at a given airspeed. Every airspeed—we could say every angle of attack—requires a given amount of thrust for level flight. If we provide more thrust, the airplane climbs; if we reduce the thrust below that which is required, the airplane descends.[2]

Most typical training aircraft climb at a lower airspeed than they will normally be flown in cruise. The C-172, for example, might achieve Vy at sea level at around 75 KIAS, cruise climb at around 80-85 KIAS, and would cruise at around 100 KIAS.

The C-172 simply does not have enough power to do much climbing at 100 KIAS. So, when leveling off, recovering, from a climb, we are changing attitude, airspeed and power all in a short period of time. Each of these changes produces some interesting dynamics, all of which must be controlled successfully for the climb recovery to look simple, feel smooth, and appear to be "under control".

So, let's explore.

A couple of basic techniques can be helpful in achieving success in a smooth, controlled climb recovery and they won't hurt the rest of our flying a bit: holding the controls in the correct manner and trimming the aircraft properly.

I have often wondered whether the bumpy parts on the back side of the control yoke or stick are the result of pilots using the classic death grip to hold the controls. I may well have been a contributor to that problem on several of the airplanes I have flown at one time or another. The problem with holding the control yoke or stick with an overly firm grip is that sensitivity is lost.

The tighter you hold the yoke or stick, the less clearly you are able to feel what the airplane is doing and the less sensitivity you have to maintaining positive yet gentle control of the flight path.

While the airplane may require a slightly firmer grip when manoeuvring than that used in cruise, refrain as much as possible from gripping the controls as though they were trying to escape with your last nickel. "Firm, positive, yet gentle" is the key phrase to keep in mind. Maintain your sensitivity to the flying machine's subtle messages.

Many experienced pilots recommend what might be termed a "pulsing grip" which involves holding the controls gently but firmly, then consciously relaxing your grip for a second or two to monitor the aircraft's behaviour. If it remains stable in the flight condition you are seeking, well and good. If it expresses an opinion about changing altitude, attitude or

1 Todd Pezer, http://www.betterpilots.com/3.html

2 For those interested in these things, the relationship between thrust and climb is: Sin (climb angle) = (Thrust – Drag)/Weight.

heading, an adjustment to trim is called for. Keep repeating your pulsing grip throughout the flight and adjust trim, as required, whenever required.

Trimming the airplane for the attitude you want and need is one of the really critical skills in all aspects of flying. The untrimmed airplane develops an opinion which may well differ from yours. An improperly trimmed flying machine will fight you every inch of the way and make life much more difficult than necessary.

Properly trimming a flying machine allows the controls to become essentially neutral and ready to accept small control inputs from the pilot, as required.

Proper trimming is not achieved as a one-time solution. It is an ongoing process. Any change, even minor, in the ambient environmental conditions—temperature, air density, vertical wind currents, humidity—all affect the airplane's interaction with its environment and will require appropriate adjustments in trim.

The changing weight of the aircraft as it burns fuel, any shift in weights—a passenger shifting in his or her seat, for example—or any changes in power setting, will also require slight adjustments to trim setting.

Your gentle touch on the control yoke or stick will transmit the airplane's need for readjusting trim if your fingers are light and easy on the yoke or stick.

Adjusting trim following any change in the correct order is also helpful. Elevator trim is adjusted first to set the basic attitude for the flight condition you want to achieve. Next, adjust the rudder trim, if so equipped, and finally, adjust aileron trim, if so equipped.

Remember to release your grip on the control yoke or stick following each adjustment to test how well you have achieved your goal of the perfectly trimmed airplane.

If your machine is not equipped with aileron and rudder trim—most light training aircraft are not—and it refuses to fly straight and level when left to its own devices after being properly trimmed, it may have developed some rigging issues which can, perhaps, become a discussion item between you and your favourite aircraft mechanic.

Sometimes, a slight tweak to the aileron activation rods, the adjustments for strut tension, or the fixed trim tab on the rudder can do wonders.

Some years back, I spent something like three months tweaking the adjustment of the strut tension on a little Citabria I owned until I was finally happy to find she would fly hands-off. It was worth the effort.

So, here we are in a nice, controlled, stable climb at, perhaps, 80 KIAS with a nose up angle of around 6°, coming up to our specified altitude and getting ready to recover smoothly. Remember, changes in attitude, altitude and power all require some lead time to execute properly.

Our machine has momentum and would like to continue doing what it is doing; like most of us, it will resist change. It is our job, as the brains of the outfit, to manage that change with the least disruption possible.

The basic rule of thumb for recovery is to "lead" our inputs so change is smooth and controlled. We would like to level off, recover from the climb, at exactly the altitude we have been assigned or intend. For recovery from either a climb or a descent, 10 percent of our rate of climb (ROC) normally works very well. If we are climbing at 500 ft/min, a pretty standard ROC for underpowered training aircraft, we will want to initiate our recovery from the climb about 50 ft before reaching our intended altitude. For IFR training, a standard call might be, "100 below" which gets us alerted to begin the process.

The recovery process requires that pitch angle, attitude and power setting all change in a unified and coordinated manner. Synchronizing all these changes is the tricky part, but it can be done, remembering throughout the procedure that changes to each of these three components will produce unwanted yaw tendencies which we will also want to anticipate and control.

Fifty ft below our intended altitude, we initiate the recovery process by lowering the nose half our angle of climb, in this case 3°. The vertical speed of the airplane will quickly begin to decay, but the lag in our vertical speed indicator (VSI) will not really show this change right away. Our airspeed will begin to increase. As soon as the airspeed begins to increase, we will want to adjust our trim setting to help keep the nose down where we want it, and we can anticipate a slight yaw to the left caused by gyroscopic precession—changing the spatial orientation of the propeller much like the yaw experienced when lifting the tail of a conventional gear aircraft on takeoff—which we will compensate for with a touch of right rudder.[3]

At 25 ft below our intended altitude, we can lower the nose another 1.5°, again half the nose up angle, adjust that trim again to keep the nose where we want it and anticipate the slight yaw tendency. Airspeed will be increasing and our rate of climb will be decreasing.

As we approach our intended altitude, our airspeed should be approaching cruise speed and our rate of climb should be approaching zero. As we reach altitude, we lower the nose to a zero climb angle and smoothly reduce power, as required,

3 Cool video on gyroscopic precession.

to our desired cruise power setting, remembering to anticipate and control any tendencies to yaw that may arise; a reduction in power will have the tendency to produce a slight yaw to the right as slipstream is decreased, requiring a touch of left rudder to maintain heading.

Here we are, so let's get this puppy trimmed correctly to maintain our new altitude and airspeed.

The short version: attitude, trim; attitude, trim; attitude, trim; attitude, power, trim. What could be simpler?

Whether you fly with reference inside or outside, learning to execute a smooth, controlled climb recovery can make life so much easier and increase both your satisfaction in a job well done and bring smiles to those riding with you.

Alexander Burton is a Class I Instructor, Pilot Examiner and a regular contributor to several aviation publications both in Canada and in the USA. He is currently Base Manager for Selair Pilots' Association in cooperation with Selkirk College, operating their satellite base in beautiful Abbotsford, BC (CYXX). He can be contacted at: info@selair.ca △

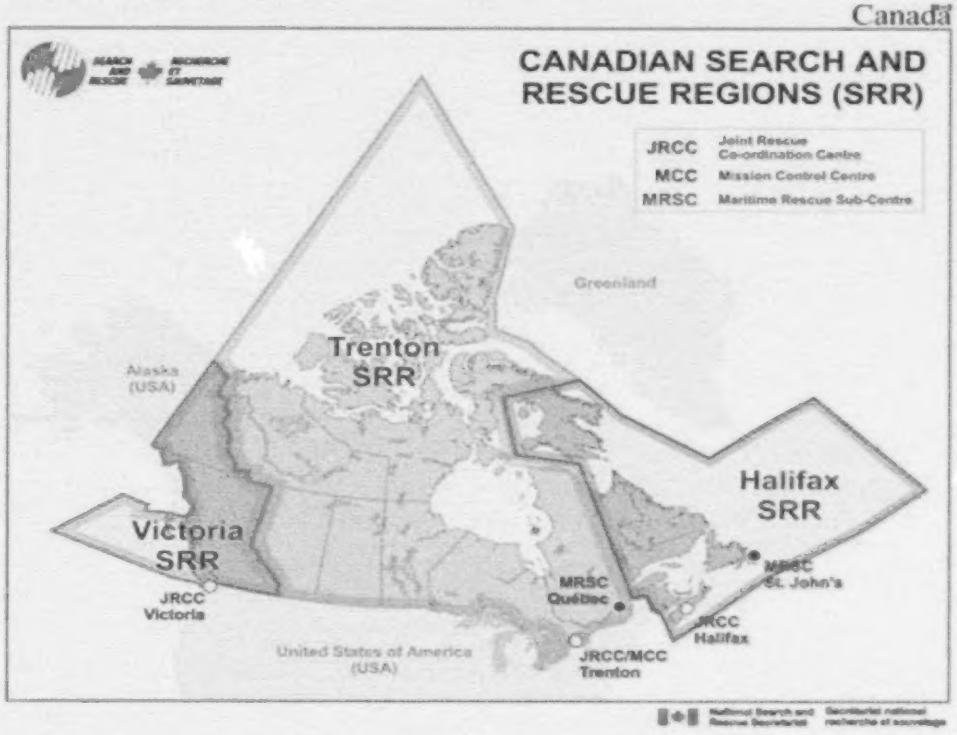
You and the National Search and Rescue Program

by Captain Jean Houde, Aeronautical Coordinator, JRCC Trenton

It is a statistical inevitability that flying activity in Canada increases as we slowly leave winter behind. Since gravity defying hobbies inherently involve some risk, an overview of Canada's National Search and Rescue Program (NSP) may be of interest.

An integral part of this program is the work done by the joint rescue coordination centres (JRCC). This article covers the role of the JRCCs and their search and rescue (SAR) mandate, and offers tips on what you can do to help them provide you with a quicker SAR response.

In 1986, the Government of Canada directed the establishment of the NSP. The NSP is a co-operative effort by federal, provincial and municipal governments along with other SAR organizations. As part of this program, the Royal Canadian Air Force (RCAF) and the Canadian Coast Guard (CCG) have been federally mandated to provide a SAR response for all aeronautical and maritime (Great Lakes and coastal waters) incidents within the Canadian Area of Responsibility.



To deal with Canada's vast geography, the country has been divided into three Search and Rescue Regions (SRR), each with their own JRCC responsible for coordinating all SAR responses for incidents within their respective region. Each JRCC is staffed 24/7 with seasoned RCAF and CCG personnel who have significant SAR experience and work jointly to prosecute SAR incident responses. The JRCCs are directly linked to SAR crews and squadrons in key parts of the country who employ aircraft and vessels along with other equipment to carry out their missions so that others may live.

As an example of the scale of operations in Canada, JRCC Trenton handled 3 064 incidents in 2012 within its SRR in an area of over 18 million km^2.

The RCAF has two primary SAR squadrons within the Trenton SRR: 424 Squadron flying CC-130 Hercules fixed-wing aircraft and CH-146 Griffon helicopters in Trenton, and 435 Squadron flying CC-130 Hercules aircraft in Winnipeg. Both these squadrons are fully trained in SAR and maintain a primary SAR standby posture 24 hours a day, 7 days a week.

SAR response posture is immediate at all times, and the crew that is on standby must aim to be airborne as rapidly as possible when they receive the call to action. During

evenings and weekends, squadrons are on a 2-hr SAR posture as personnel are not required to be on base during these times. Nevertheless, the objective is for crews to get flying as quickly as possible and generally they succeed in launching well before the 2-hr mark.

Monday to Friday from 8 a.m. to 4 p.m., crews are mandated to be on base in order to maintain a heightened 30-min posture as this timeframe represents the period during which most survivable incidents occur.

RCAF aircraft that launch from primary SAR squadrons have search and rescue technicians (SARTech) on board who are capable of penetrating an incident scene by parachuting from an aircraft or being hoisted down from a helicopter. These SARTechs, highly visible in their orange flight suits, are trained to act as the first responders to immediately assist those in peril and provide advanced trauma care. The CC-130 Hercules can dispatch supplies, clothing, food, radio equipment, life rafts, survival kits and pumps. It can also drop flares for night illumination. Equipped with significant fuel reserves, this aircraft can remain airborne for up to 14 hr, allowing it to reach all corners of the Trenton SRR.

Although there are only two primary SAR squadrons within the Trenton SRR, additional aircraft from the RCAF and other federal departments can be tasked to support an ongoing SAR case. In addition, volunteer aviation and marine organizations such as the Civil Air Search and Rescue Association (CASARA) and the Coast Guard Auxiliary contribute greatly to providing qualified search crews for SAR cases that involve extensive search areas.

Through close coordination, Canada's other JRCCs will often lend their primary SAR resources to support a SAR incident in another SRR. Commercial charter companies are also available to assist in responding to remote parts of the country. So despite the immense area, multiple resources are scattered throughout the land.

Aeronautical alerts usually come in the form of overdue aircraft, airborne emergencies, reported forced landings and emergency locator transmitter (ELT) activations. Most false alarms are resolved with a combination of sleuthing and phone calls but often the launching of valuable SAR assets is required to investigate the ELT source.

In ideal conditions, when an ELT is activated, it can be quickly identified with an accurate position and owner contact information. What this means for flying enthusiasts is that whenever an ELT is activated, rescue coordinators are working on it as a SAR case. Phone calls are made during the initial investigation stage, persons related to the event are questioned and interviewed, search plans are created, crews are briefed and SAR aircraft are launched.

It is therefore important that, in the event of an accidental ELT activation, the nearest air traffic control service be contacted immediately to prevent a SAR response from escalating unnecessarily.

As many readers know, the 406 MHz ELTs are now the accepted standard as they offer greater capabilities than their predecessor.

The older 121.5 MHz models are now limited in their effectiveness, and this can create challenges for the SAR system. As satellites no longer monitor this frequency, only high flyers and local air traffic control agencies are made aware of an active ELT transmission. This information is then passed along to the nearest JRCC. This represents a problem as no accurate position is available, and the lack of owner information to confirm the activation could result in a delayed SAR response.

Updating your ELT to a 406 MHz model is the best option for ensuring your aircraft is optimally locatable. These newer beacons are also significantly less likely to trigger false callouts.

If updating to a 406 MHz model is not feasible, some precautions can be taken to ensure proper care and maintenance of an ELT to help reduce SAR response times. Tips can include listening to 121.5 MHz before shutting down your aircraft, or if you are in distress and your ELT is activated, leave it on until positive communication is established with a SAR unit. Make a point of closing your flight plan within an hour from your planned arrival time and notify ATC of any changes to your flight plan. Always be proactive with flight following by communicating with ATC and FSSs along your intended route.

The NSP is comprised of many dedicated men and women with extensive SAR backgrounds who work around the clock in the JRCCs and at response units across the country.

Fundamentally, everyone has a role to play when it comes to preventing SAR or ensuring they can be rescued. Provided that your aircraft is well maintained, rescues have the greatest odds of success when notification time is quick and probability of survival is high. In most cases, travellers equipped with sufficient survival gear stand the best chance of being rescued.

Canada's SAR system is among the best in the world and crews with the RCAF, CCG and other partners train continuously in all elements and environments to save lives. Delivering service for incidents across 25 million km^2 is no small task, but Canada's dedicated professionals and volunteers remain committed and ready to respond whenever and wherever they may be called. △

Do You See It? The Provision of Traffic Information by Air Traffic Services

by Bob Scott, ATC inspector, NAV CANADA

The provision of traffic information to pilots by air traffic controllers and flight service specialists is a key element in ensuring safety in busy airspace, particularly where there is a mix of VFR and IFR operations.

Unlike air traffic control separation, the goal of the provision of traffic information is to increase a pilot's awareness of the position and intentions of other aircraft relative to their own operation to aid with collision avoidance.

Often however, controllers and specialists are not always certain whether that service is achieving its intended purpose. One reason is a lack of clear confirmation from pilots indicating that the traffic is in sight. Additionally, pilots may not always be certain as to when traffic information service is being provided or to what extent they need to keep a lookout themselves.

Traffic information service is provided at the following locations and under the following circumstances:

- at airports with a flight service station (FSS) where an airport advisory service is provided;
- at aerodromes where a remote aerodrome advisory service (RAAS) is being provided;
- to VFR flights within Class C airspace and upon request conflict resolution. IFR flights will be provided traffic information with respect to any relevant VFR flights, and when required, conflict resolution between IFR aircraft and VFR aircraft that are radar identified;
- to aircraft within Class D airspace. Workload permitting, conflict resolution is provided between VFR and IFR aircraft, and upon request between VFR aircraft; and
- when operating in Class E airspace where radar coverage exists, VFR flights with transponder-equipped aircraft may request radar traffic information. ATC will provide this information, workload permitting. However it is important to remember that ATC may not be aware of all aircraft in the area and pilots are responsible for maintaining a visual lookout outside the cockpit at all times.

The provision of traffic information involves point outs of relevant known or observed traffic which may be in such proximity to your aircraft's position or intended route of flight to warrant your attention. In a radar environment, it is generally provided by referring to the clock position and will include such information as the direction of flight and the type of aircraft and altitude if known.

e.g. *TRAFFIC, TEN O'CLOCK, THREE AND A HALF MILES, NORTHBOUND C172, ONE THOUSAND FEET BELOW YOUR ALTITUDE.*

Often, air traffic services will hear back from the pilot "Alpha Bravo Charlie *with the traffic*" leaving it unclear to the air traffic service provider whether the pilot in fact has the traffic in sight.

If you do not see the aircraft referred to in a traffic advisory, it is important that you let air traffic services know. A more correct acknowledgement would be "Traffic in sight" or "Looking for the traffic".

We understand that view from the cockpit can be limited, and the line-of-sight angle might not always allow you to see the other aircraft and, particularly in a terminal environment, it can be a busy time in the cockpit.

If an air traffic controller or flight service specialist knows you do not have the traffic in sight they will continue to provide traffic updates until visual separation is established or no longer required. If they incorrectly believe you have the traffic in sight however, they may assume visual separation has been established. This can result in an unsafe situation.

Precision in responding when traffic information is passed is critical to ensuring a safe operating environment for all aircraft. Do not hesitate to advise air traffic services if you don't see the other aircraft initially, or, if you lose sight of it. △

Worth Watching—Again! NAV CANADA's "The First Defence: Effective Air Traffic Services-Pilot Communication" Video

Voice communication between pilots and Air Traffic Services (ATS) personnel is a critical safety link in the ATS system. As part of the effort to increase awareness of the risks associated with non-standard communication, the Air Traffic Services-Pilot Communications Working Group produced this excellent video as part of the "First Defence" awareness campaign. It's time well spent!

2012 David Charles Abramson Memorial (DCAM) Flight Instructor Safety Award

The recipient of the 2012 DCAM Flight Instructor Safety Award is Paul Harris, manager of flight operations at the Pacific Flying Club, Vancouver, B.C. The award was presented to Mr. Harris by award co-founder Rikki Abramson on November 14, 2012, at the Air Transport Association of Canada (ATAC) Annual General Meeting and Tradeshow in Vancouver, B.C.

Mr. Harris, considered an innovator in the field of flight instruction, has accumulated over 12 000 hours of flying experience in over 20 years. His greatest contribution to aviation safety is the next generation of flight instructors that he has trained. Paul strongly believes in cultivating leadership skills in his students. He also firmly believes that the safest pilot is the one who has been trained to the highest possible standard of discipline. He always directs his efforts to the task of properly training the people who will teach others to fly.

Two deserving nominees were also recognized for their professionalism: Patrick Lafleur, chief flight instructor at Passport-Helico, Que., and Chris Walsh, director of training and manager of corporate safety and quality at Moncton Flight College, N.B.

The annual DCAM Award promotes flight safety by recognizing exceptional flight instructors in Canada and has brought recognition and awareness to the flight instructor community. The recognition of excellence within this segment of our industry raises safety awareness, which will hopefully be passed on for many years to come.

Left to right: Wayne Gouveia (ATAC Board of Directors), Paul Harris and Rikki Abramson.

The deadline for nominations for the 2013 award is September 13, 2013. For details, please visit www.dcamaward.com. △

TC AIM Snapshot: High Intensity Runway Operations (HIRO)

Several of Canada's airports rank among North America's busiest in total aircraft movements. HIRO, as a concept, have evolved from procedures developed by high density terminals in North America and Europe. It is intended to increase operational efficiency and maximize the capacity at those airports where it is employed through the use of disciplined procedures applied by both pilots and air traffic controllers. HIRO is intended to minimize the occurrence of overshoots that result from slow-rolling and/or slow-clearing aircraft and offers the prospective of reducing delays overall, both on the ground and in the air. In its fullest application, HIRO enables ATC to apply minimum spacing to aircraft on final approach to achieve maximum runway utilization.

The tactical objective of HIRO is to minimize runway occupancy times (ROT) for both arriving and departing aircraft, consistent with both safety and passenger comfort. Effective participation in HIRO results when the pilot of an arriving aircraft exits the runway expeditiously, allowing the following arriving aircraft to cross the threshold with a minimum time interval. In the case of an arrival and a subsequent departure, the arriving pilot clears the runway in a minimum ROT, permitting a departure before the next arrival crosses the threshold. The air traffic controller's objective in HIRO is to optimize approach spacing. This can be best achieved when pilots reach and adhere to assigned speeds as soon as practicable.

(Ref: *Transport Canada Aeronautical Information Manual* (TC AIM), Section RAC 4.4.10)

Flight Operations

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Task-Competency and Wearing of Helmet Identified as Main Issues in Glassy Water Accident

On May 20, 2011, a tragic accident claimed the life of an experienced helicopter pilot engaged in the demanding world of water bucketing operations in support of forest fire suppression. The Bell 212 was in the vicinity of Slave Lake, Alta. During an approach to Lesser Slave Lake to pick up water in calm winds and glassy, mirror-like conditions, the helicopter crashed on its right side into the lake, and was severely damaged. While the pilot had accumulated thousands of hours of flying time, his actual experience in water bucketing operations was less extensive; this lead the Transportation Safety Board of Canada (TSB) to address, in its final report, the issue of task competency versus total flight time for pilots engaged in such operations. In addition, as the pilot had left his helmet in its carrying bag on the back seat, the wearing of the helicopter helmet is identified as a recurring theme. The following article is based on TSB Final Report A11W0070.

History of Flight

The helicopter departed from the Slave Lake Airport, proceeded to the Lesser Slave Lake shoreline near the Canyon Creek hamlet and began water bucketing operations. Water pickups were made near the south shore of the lake and drops were made on a fire approximately 0.8 NM south of the shoreline. On its twelfth pickup, while on short final, the helicopter abruptly descended forward, in a near-level attitude, to within several feet of the water surface. Subsequently, the helicopter climbed to approximately 100 ft above the lake surface and then rolled rapidly to the right and descended vertically into the water.

Within approximately three to four minutes, municipal firefighters in the vicinity entered the water, removed the pilot from the wreckage and administered first aid until emergency medical personnel arrived. However, the pilot succumbed to head injuries as a result of the impact.

The helicopter was certified, equipped, and maintained in accordance with existing regulations and approved procedures. It had no known deficiencies, the weight and centre of gravity were within limits and there was sufficient fuel on board.

Water Pickup Location

In calm wind conditions, water can take on a glassy, mirror-like appearance which significantly reduces a pilot's depth perception. If a pilot does not have adequate visual references when flying over glassy water surfaces, difficulties may be encountered in judging height above water and gauging forward speed. The TSB has investigated numerous occurrences where glassy water was either a causal or contributing factor.

To help ensure adequate visual references to safely manoeuvre a helicopter during a water pickup, it is common practice to make pickups as close to shore as possible. This allows the pilot to use the shoreline and surrounding terrain to help judge height above the water as well as the rate of closure during the approach.

The pilot carried out pickups between 300 ft and 1 050 ft from the shoreline. The investigation examined the water pickups conducted by another pilot. On average, the other pilot's pickup location was between 100 ft and 200 ft from the shoreline. The occurrence pilot had been advised by another company pilot to make his pickups as close to shore as possible due to the smoke and glassy water conditions in order to maximize visual references.

Water Bucketing Operations

The helicopter was configured to carry external loads on a hook mounted on the underside of the helicopter's belly. A 100-ft long line attached to the belly hook was being used with a 350 imperial gal. water bucket. The bucket was 23 ft long when suspended, for a total long line length of approximately 124 ft.

The belly hook can be released either electrically or manually. A button on the cyclic control stick is the primary release. To arm this electrical release, the pilot must select the hook release switch, which is guarded and located in the overhead console. The manual release is designed as a backup in an

emergency, if the electric release fails. To activate the manual release, the pilot must take one foot off the anti-torque control pedals and use it to push the release pedal.

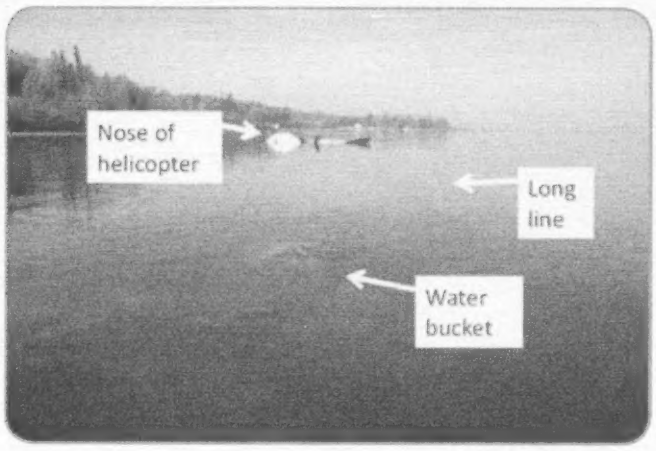
Bell 212 Flight Manual Supplement (BHT–212–FMS–3) directs pilots to arm the hook for takeoff, disarm it for in-flight operations (e.g., cruise), and arm it before final approach. Arming the hook prior to takeoff and final approach allows the pilot to quickly release the load should a problem arise during a critical phase of flight. Disarming the hook during cruise reduces the risk of an inadvertent release.

In many cases, dropped loads are the result of pilots accidently triggering the electrical release. As previously established in TSB occurrence A09P0249, many pilots choose to fly with the belly hook electrically disarmed to reduce the risk of an inadvertent load release. The electric release was found in the disarmed position on the occurrence aircraft.

Pilot Competencies for Helicopter Wildfire Operations

After the 2007 Helicopter Association of Canada (HAC) convention, a number of provincial agencies responsible for forest firefighting and the HAC agreed that pilot eligibility for roles in wildfire suppression should be based on a task-competency model rather than relying solely on flight hours. In 2010, the HAC, through its Air Taxi Committee subgroup, the Pilot Qualifications Working Group, developed a document entitled *Pilot Competencies for Helicopter Wildfire Operations – Best Practices Training and Evaluation.*

Alberta Sustainable Resource Development (ASRD) developed an operating handbook for pilots in 2010 and issued an amended version, the *2011 Pilots Handbook*, the following year. The *2011 Pilots Handbook* endorses the use of qualifications and training competencies identified in the HAC document *Pilot Competencies for Helicopter Wildfire Operations.* The operator did apply these standards for its pilot checks at the start of the 2011 season.



Helicopter Crash Location

An examination of the wreckage revealed that the collective was found in the full up position, and all collective connections to the engines were consistent with full power being requested. There was no indication of any system malfunction prior to the occurrence. Damage was consistent with the helicopter landing with a high downward velocity on its right side at impact.

The pilot seat had little structural damage. However, the left side lap belt attachment point had torn loose as a result of the impact. It was also determined that the pilot was not wearing the available shoulder harnesses at the time of impact. These harnesses are designed for use when the pilot is sitting upright in a normal flight position. It is common practice for pilots not to wear the shoulder straps while long-lining because it can hinder upper body movement to the bubble window.

Pilot

The pilot held a valid Airline Transport Pilot Licence–Helicopter, and had close to 5 000 total flight hours on a variety of helicopter types, including 200 hr on the Bell 212. In April 2011, the pilot passed the company Pilot Proficiency Check (PPC) on the Bell 212 after completing the operator's training program, which included the HAC-developed *Pilot Competencies for Helicopter Wildfire Operations.*

While the pilot had significant total flying experience on a variety of helicopter types, his Bell 212 time was relatively low, and he had not done any external load operations with any of his employers in the previous 5 years. Of the approximately 500 hr of external load operations he had accumulated up to 2005, only 20 hr had been recorded as long line work. The TSB further determined that on the Canadian Interagency Forest Fire Centre (CIFFC) Pilot Directory, the pilot had listed 500 hr slinging, 50 hr long lining and 50 hr water bucketing. The TSB was unable to reconcile the discrepancy.

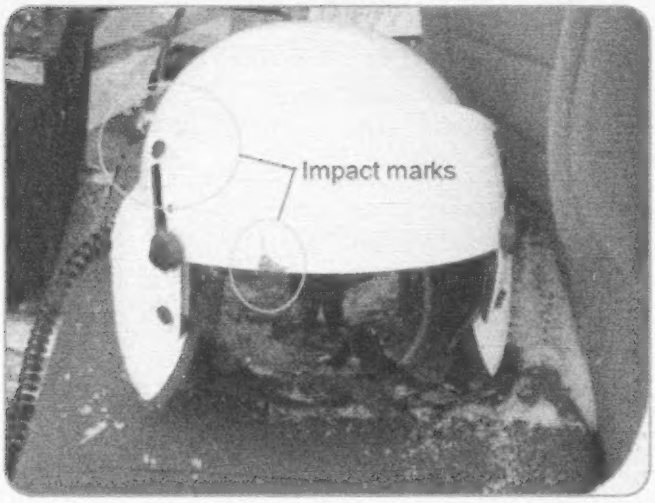
Flight Helmets

The pilot, who was not wearing a flight helmet, received severe head injuries during the impact sequence. The pilot's flight helmet was found inside its bag at the rear of the helicopter cabin. The pilot was not required by the operator to wear a helmet, nor is there a regulation requiring helicopter pilots to wear head protection.

The second most frequently injured body region in survivable helicopter crashes is the head. According to United States military research, the risk of fatal head injuries can be as high as 6 times greater for helicopter occupants not wearing head protection. The effects of non-fatal head injuries range from momentary confusion and inability to concentrate to full loss of consciousness. Incapacitation can compromise a

pilot's ability to escape quickly from a helicopter and assist passengers in an emergency evacuation or survival situation.

Transport Canada (TC) has long recognized the safety benefits of using head protection, including in its 1998 *Safety of Air Taxi Operations Task Force* (SATOPS) Final Report. TC committed to continue to promote to helicopter pilots the safety benefits of wearing helmets—especially in aerial work operations and flight training units—in its safety newsletters and other promotional materials. An example are the two excellent articles titled **"Helicopter Safety Helmets—A Hard S(h)ell"** and **"Low Usage of Head Protection by Helicopter Pilots"** published in Issue 2/2010 of the *Aviation Safety Letter*.



This helmet was retrieved from an AS350 accident in Atlantic Region (TSB File A07A0007). The other pilot was not wearing his helmet and suffered serious head injuries.

In addition, SATOPS recommended that helicopter operators, especially aerial work operators, encourage their pilots to wear helmets, that commercial helicopter pilots wear helmets and that flight training units encourage student helicopter pilots to wear helmets.

The TSB has documented a number of occurrences[1] where the use of head protection likely would have reduced or prevented the injuries sustained by the pilot.

The high-profile crash of a Sikorsky S-92 in March 2009 (TSB Final Report A09A0016) demonstrated that despite the well-documented safety benefits and the challenging nature of helicopter flying, a majority of helicopter pilots continue to fly without head protection. Likewise, that investigation found that most Canadian helicopter operators still do not actively promote or require the use of head protection by company pilots.

In recognition of the benefits of head protection, the HAC Board of Directors passed a resolution on June 27, 2011, strongly recommending to its operator-members that they should promote the use of helmets for helicopter flight crew members under all operational circumstances which permit their use. HAC also pointed out, however, that certain pilot/aircraft type configurations may preclude safe helmet use.

Analysis

The TSB determined that the pilot was conducting water pickups at a considerable distance from shore over glassy water. The glassy water conditions that would have made depth perception difficult were compounded by the lack of visual references due to the distance from shore. The helicopter had not yet come into the hover when the water bucket inadvertently entered the water. This resulted in a violent pull rearward and to the left, causing it to descend and roll to the right. The pilot likely overestimated the helicopter's altitude while on final approach, due to glassy water conditions and a lack of visual references, which led to the water bucket inadvertently entering the water.

The helicopter then descended to within several ft of the water. The pilot's subsequent attempt to recover would have required both hands on the controls, precluding arming the belly hook's electrical release. When the helicopter climbed, it is likely that the combination of the long-line tension, helicopter movement, and high power setting caused the helicopter to roll to the right and descend quickly into the water.

Because the belly hook was electrically disarmed, the pilot's ability to jettison the water bucket was limited. It is possible that the pilot released the belly hook using the manual release located between the pedals using one of his feet or it may have been released on impact. Irrespective of how the

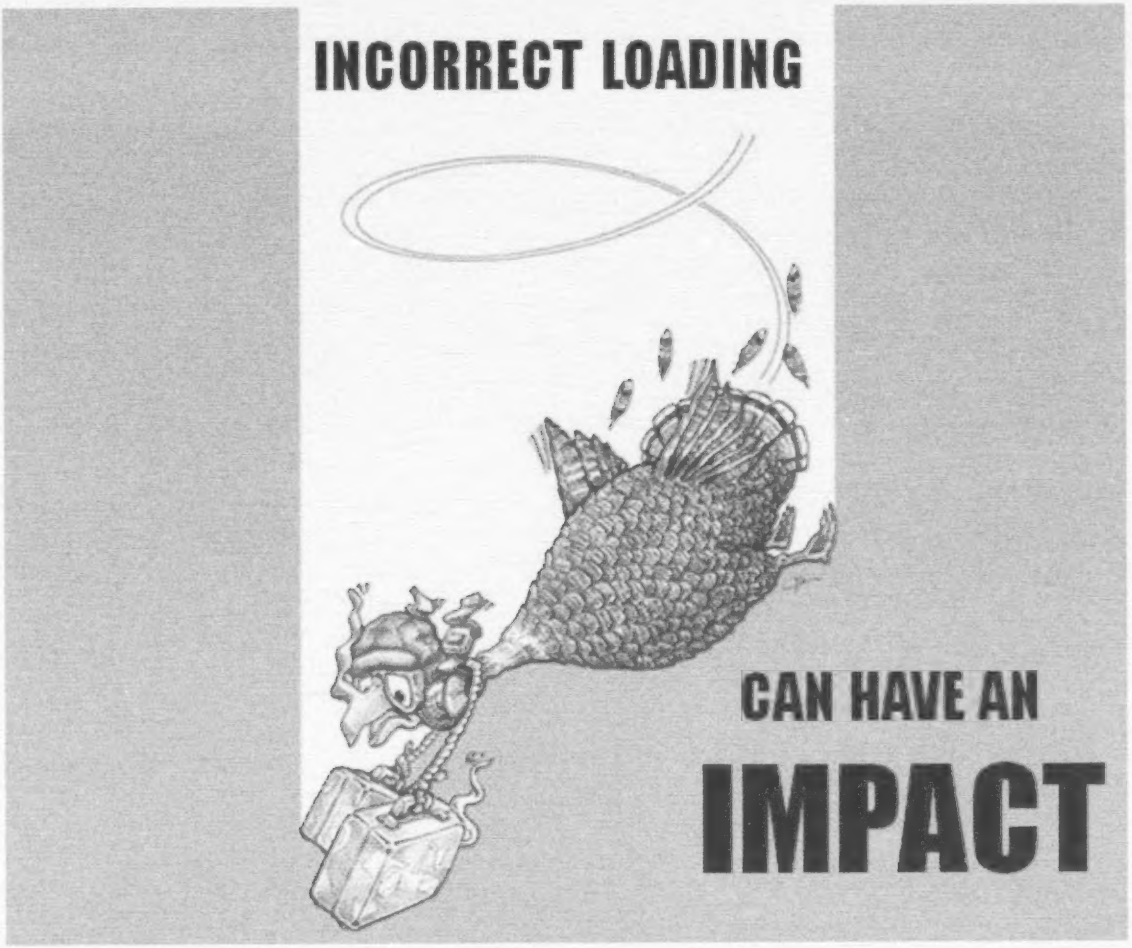
1 TSB Occurrences: A98W0086, A95A0040, A94W0147, A94Q0101, A93Q0237, A91W0046, A87P0089, A87P0025, A87P0023, A86C0060, A85P0011, A05P0103, A95P0215, A99P0070 and A09A0016.

hook was released, the helicopter impacted the water before the pilot was able to regain control.

The pilot was not wearing his helmet, which contributed to the severity of his head injuries. Helicopter pilots who fly without a helmet are at a greater risk of incapacitation due to head injuries incurred during ditching or a crash.

The pilot had the basic qualifications required for this type of work, however he had minimal recent experience in external load operations, and the TSB could not reconcile some discrepancies they identified in the pilot's documented slinging and water-bucketing experience.

In conclusion, despite the fact that he trained for and passed the company PPC—including the upgraded task-competency standard developed by the HAC—the experienced pilot appears to have been caught by a combination of events: glassy water conditions; pick-up point further away from shore, reducing the visual reference field; limited recent operational experience for the task at hand; a potentially life-saving helmet resting on the back seat. △



Operating Unmanned Aircraft Systems in Canada

by Karen Tarr, Civil Aviation Inspector, Flight Standards, Standards Branch, Civil Aviation, Transport Canada

What is an Unmanned Aircraft System (UAS)?

Unmanned aircraft are considered aircraft under the *Aeronautics Act* and are governed by the *Canadian Aviation Regulations* (CARs). An unmanned aircraft system is a set of configurable elements consisting of an unmanned aircraft, its associated control station(s), the required command and control links and any other elements as may be required, at any point during flight operation. Unmanned aircraft are operated by a pilot that is remote from the aircraft.

There are several different terms for UAS, but they all have the same meaning. While the term used in the CARs is "unmanned air vehicle" (UAV), "unmanned aircraft system" (UAS) is the term that is presently used by the global community. The International Civil Aviation Organization (ICAO) has recently developed the term "remotely piloted aircraft system" (RPAS) and Canada will harmonize with ICAO's terminology in future.

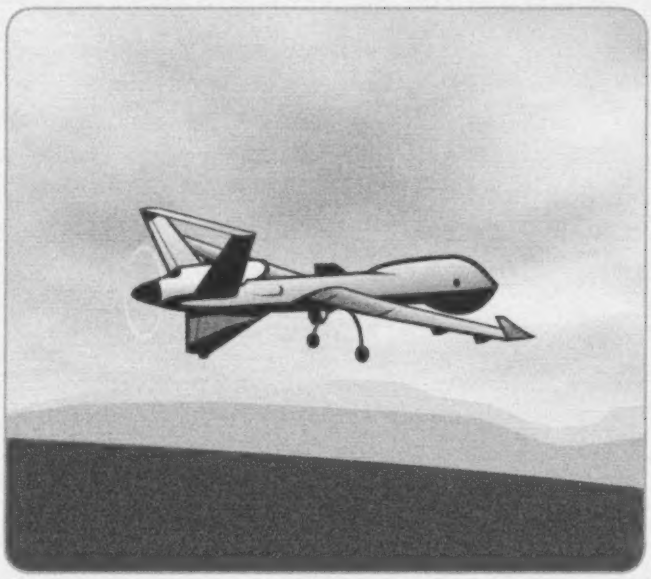
Special Flight Operations Certificate

In Canada, the CARs require anyone conducting UAS operations to obtain and comply with the provisions of a Special Flight Operations Certificate (SFOC). Applications for operating certificates are dealt with on a case-by-case basis. Individual assessments of the associated risks have to be conducted for each operation.

The certificate applicant is expected to evaluate the risks associated with the proposed operation and provide risk mitigation measures. Operating certificates are issued once a potential operator demonstrates that the risks associated with the operation of the UAS can be managed to an acceptable level.

The requirement for a SFOC is intended as a means of providing a set of operating conditions that the Minister of Transport deems necessary for safe operation. With unmanned aircraft being so diverse in terms of aircraft performance capabilities, mission requirements, operating environment and complexity of the operation, the conditions outlined in operating certificates vary.

The certificate holder has responsibility to ensure that the UAS operation is conducted in such a way that the safety of persons and property on the ground and other airspace users is not jeopardized. If an operator is found to be in contravention of the CARs and the terms of the SFOC, under the *Aeronautics Act*, Transport Canada may issue fines for contravening the regulated safety requirements.



UAS have a wide range of potential uses which will continue to expand.

UAS Operations

SFOCs are being issued for many purposes, including, but not limited to, research and development, flight testing and evaluation, flight training, aerial photography, aerial inspections, demonstration and marketing flights, geophysical data acquisition, meteorological surveying, scientific data collection and crop inspections. UAS have a wide range of potential uses which will continue to expand as the critical technology issues that must be addressed to achieve the goal of safe, routine use of the airspace by unmanned aircraft are resolved.

UAS Program Design Working Group

In 2010, the Canadian Aviation Regulation Advisory Council (CARAC) established the Unmanned Aircraft System Program Design Working Group. The purpose of this group is to make recommendations for amendments to current aviation regulations as well as introduce new regulations and standards for the safe integration of routine UAS operations in Canadian airspace.

In order to accomplish the vast amount of work required, the working group is divided into a main working group and three subgroups. The three subgroups are divided into the following subject areas: people, product and operations and access to airspace. The sequence of the work assigned to the working group will be conducted in four distinct phases of work with each phase of work defining regulatory requirements for larger and more complex operations. Completion of Phase 4 work is expected to occur by 2017.

Phase 1 work is now complete and deliverables were presented to the CARAC Technical Committee in June 2012. Phase 1 addressed small UAS operations where the maximum takeoff weight of the aircraft is 25 kg or less and the aircraft is operated within line-of-sight under visual flight rules. Phase 2 work is now beginning for small unmanned aircraft operating beyond visual line-of-sight.

Small UAS Operations

Regulatory changes based on the recommendations from the Phase 1 report will not be developed at this time. Rather, the guidance material for processing SFOC applications will be updated to incorporate the Phase 1 recommendations for the operation of small UAS within visual line-of-sight. Therefore, while SFOCs will be required for the foreseeable future, operating certificate approvals should be more predictable and timely as the guidance material for processing applications is updated.

Once the updated guidance material becomes available, UAS operators are encouraged to take proactive steps to ensure that the way they are conducting business aligns with the Phase 1 recommendations. These recommendations include, for example, the aircraft meeting a design standard, the operator establishing ground and flight training programs and establishing and maintaining an operations manual and standard operating procedures.

Challenges Ahead

There remain many key challenges ahead for the safe integration of routine UAS operations, e.g. aircraft and system certification, reliable command and control links, reliable and protected spectrum and the ability for the UAS to sense and avoid other traffic and airborne objects in a manner similar to manned aircraft. Transport Canada will continue to work with the UAS community to develop regulations and address the challenges to UAS integration. △

Wind Effects on Idling Rotorcraft

The following text is based on an accident prevention bulletin by the United States Forestry Service and is shared with the Aviation Safety Letter *audience for its value in safety promotion.*

Discussion: On September 26, 2011, a Eurocopter AS-350BA sustained substantial damage after winds caused the aircraft to lift up and roll over on a ridgeline near Juneau, Alaska, despite the engine operating at idle rpm (NTSB # ANC11LA108). The aircraft had landed on the top edge of a steep slope where winds were forecast to be strong and erratic due to an arriving low pressure system over the area. The National Weather Service (NWS) forecasted the surface winds at 35 to 45 kt, however, NWS hourly observations from three different observation locations indicated maximum velocities ranging from 10 to 29 kt.

In an effort to better understand how this accident occurred, Eurocopter simulated the event with a similar aircraft of the same weight and rotor speed, and other environmental features including surrounding terrain (based on pictures supplied from the accident site), landing surface, and winds. The simulation revealed that the aircraft could be lifted off the ground with a wind speed of as little as 37 mph (32 kt) when the impact angle struck from below the rotor disc. As the relative wind angle moves upward toward a level plane with the rotors, the wind velocity required to lift the aircraft increases.

Research of accident reports from the National Transportation Safety Board (NTSB) discovered a similar incident in December 2008 where a Kaman K-1200 helicopter was upset by wind gusts that fatally injured one ground crew member (NTSB # WPR09LA057). In this particular case, the pilot started the helicopter during light and variable quartering tailwinds of what he estimated to be 15 kt. The NTSB investigation determined the winds at the accident site most likely exceeded the maximum wind allowed with reference to the helicopter's prevailing wind envelope, which resulted in the helicopter lifting to the left and rolling over.

Key Points:

- In both instances, winds were forecast to be erratic and gusty, yet local observations were within the published aircraft limits.
- Both aircraft were operating at idle rotor rpm.
- In one situation, ground crew were in close proximity which ultimately resulted in a fatal blade strike.
- There had been no understanding by either crew of a similar event ever happening and they were not alert for this type of control loss.

Recommendations:

- Project Aviation Safety Plans (PASPs) should be shared amongst all aircrew (including the pilot) in order to ensure

pertinent safety related information is communicated. This may require extra coordination when dealing with vendors (contracted personnel).

- Avoid ground personnel movement within the area of the rotor arc when starting, shutting down, or at ground idle.
- Flight crews are required to:
  - know wind limitations for start up and shut down for the make/model operated;
  - plan for flight conditions based on current observations AND forecast weather;
  - base operating rpm on peak wind conditions and plan for additional fuel requirements as necessary when loitering on the ground;
  - be aware of the affects of wind blowing from below the rotor disc and plan the landing site selection accordingly; and
  - account for rising terrain in the preflight planning process, as it can generate orographic turbulence and greatly accelerate wind velocity as the air travels over the top.

A look back at past occurrences...

This accident prevention bulletin prompted us to look for past occurrences of helicopters being lifted by a gust of wind in Canada. The following scenarios differ slightly from one another, but it is clear that helicopters running on the ground—whether at flight idle or 100 percent rpm—are at risk from wind gusts. In some of the cases below, the pilot even leaves the aircraft with the engine running and rotors turning, which is rarely a good idea. Here are some examples provided to us by the Transportation Safety Board of Canada (TSB):

On September 4, 1978, the pilot of a Bell 206 landed in British Columbia, let his passengers deplane, and brought the throttle to idle. He then got out to inspect the terrain and a gust of wind caught the blades and overturned the aircraft. (*TSB file A78W0098*).

On August 20, 1981, a Bell 206 had landed on a rocky ridge in British Columbia to offload a firefighting crew. As the last passenger stepped down from the aircraft, a strong gust of wind rolled the helicopter to the right. The main rotor struck a tree and the helicopter slid, on its side, down the ridge to the bottom of a ravine. At the time, the winds were reported to be gusting to 60 mph. (*TSB file A81P0085*).

On September 2, 1982, the pilot of a Bell 206 landed into a light wind on a ridge in British Columbia which dropped sharply down several thousand feet to a valley. The main rotor disc extended over the face of the summit. As the stopover was short, the pilot did not shut down the engine, but throttled back to flight idle, applied the collective and cyclic frictions, and left his seat with one foot on the skid; while doing so, he did not retain full control of the cyclic. Suddenly, a strong gust of wind came up the ridge and the aircraft lurched into the air. The helicopter came to rest upright 30 ft away after the main rotor blades had hit the ground, severed the tip of the right skid, and shattered the right bubble windshield. (*TSB file A82W0074*).

On July 30, 2006, a student pilot in an amateur-built Rotorway Exec 162F was performing engine and dynamic system checks on private property in Alberta. The pilot applied enough collective to become light on the skids to determine torque pedal effectiveness. At that time, a strong gust of wind moved the helicopter laterally resulting in a dynamic rollover to the right. The pilot sustained minor scratches and cuts and the helicopter was substantially damaged. (*TSB file A06W0128*).

The next (and last) account comes from a veteran helicopter pilot who witnessed a similar event, leading to the loss of a helicopter after it was left running unattended.

"In the mid-seventies, when I was working as a pilot in Northern Quebec, we lost a company Bell 206B on a landing pad because of this phenomenon. The pilot, "Joe", was an experienced young lad who landed that day on a plywood pad on a small rise along the bank of a river. He landed on the pad facing a southerly direction, with the tail of the helicopter out over the river bank. It is possible that the rear of the skids may not have been in full contact with the pad, but that remains unknown to this day. As we all know, the B206 footprint is weight-biased directly below the mast, toward the rear of the skids. This can result in a nasty trap for the unwary if the rear of the skids are not in full contact with the supporting surface, and this may have been a contributing factor in this accident.

After landing, the passengers disembarked and the pilot realized that there was a package that needed to be offloaded from the cargo compartment which was located on the opposite side of the aircraft from the pilot's position. The passengers had left, and Joe couldn't get anyone's attention. He was in a hurry to get going and retrieve other workers from the bush, but rather than making a radio call for assistance, he tightened the

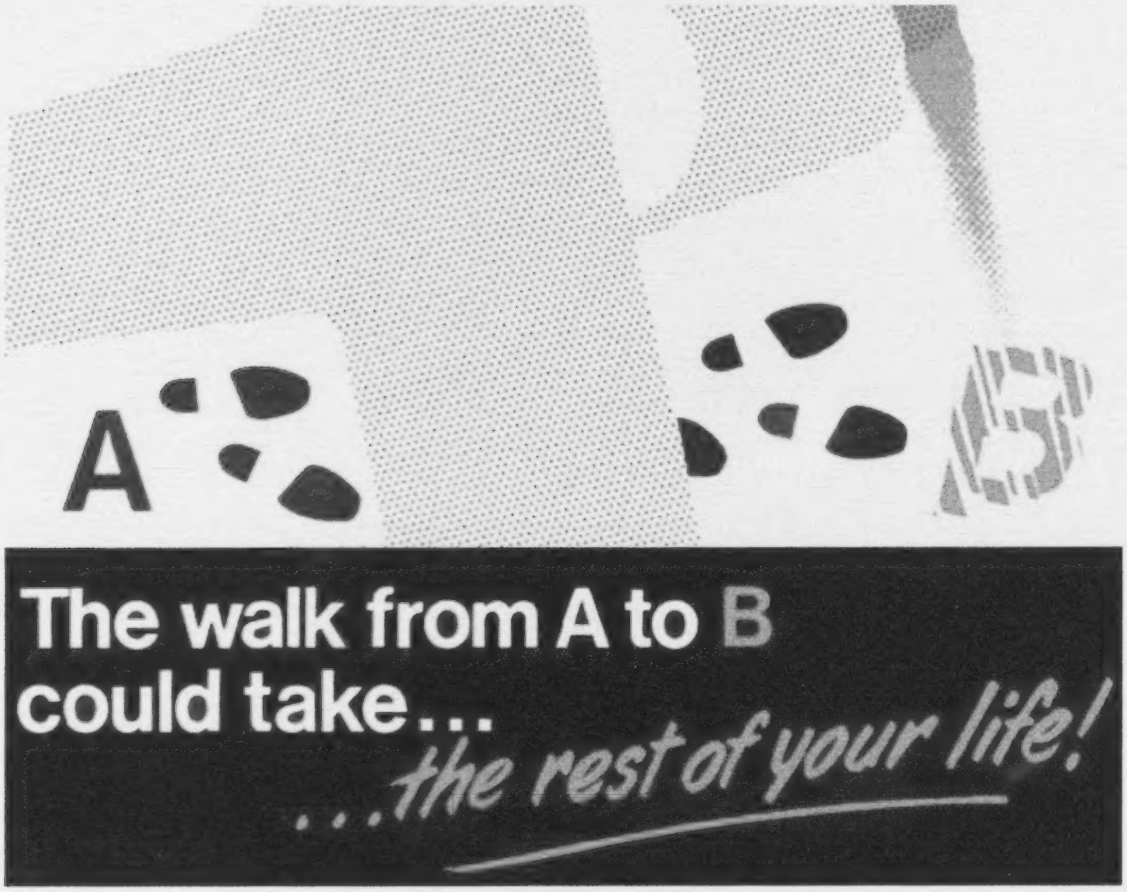
frictions and turned the hydraulics off. He left the throttle in the flight position to facilitate a rapid departure. He jumped out, intending to run around the aircraft to open the cargo compartment and simply drop the package on the helipad. The aircraft was now unoccupied, running at 100% rpm, and was exposed to a gusting westerly wind (10 kt or so) along the river.

Joe told us that, as he passed the nose of the helicopter, it suddenly rose up, pivoting about the rear skids. He tried to jump on the skid toes to gain control, but he ended up falling to the ground, and was struck by the nose of the aircraft as it went almost vertical and drifted backwards, airborne. He suffered a minor gash to the face. (It could have been a lot worse). The helicopter continued backwards, sinking and striking the tail. It subsequently crashed on the bank of the river, some distance below the plane of the helipad. It immediately caught fire and was totally destroyed.

In my opinion, the initiator was the change in the centre of gravity which shifted aft suddenly when the pilot left the aircraft. This may have been exacerbated by the unevenness of the pad, or the position of the helicopter on the pad. Joe was an experienced pilot, but he may not have placed the aircraft far enough forward on the pad to prevent a rotation about the rear contact point when he climbed out. The actual aircraft position on the pad could not be verified.

The final straw appears to have been the exposure of the helicopter on an elevated pad to a cross wind of some strength. The cumulative effect of these forces appears to have caused this accident. It can be argued that even without the wind factor, a 206 placed too far aft on the helipad might have flipped over anyway. However, Joe reported that the aircraft actually flew a short distance before the tail struck the river bank. The aircraft's final position down the embankment seems to verify that; otherwise, the helicopter would have ended up immediately behind the pad.

In the end, regardless of the wind conditions, leaving any helicopter with rotors turning and no one at the controls invites disaster from various causes. In this case, the aircraft came to a fiery and dramatic end. △



Maintenance and Certification

Emergency Locator Transmitter (ELT) Maintenance: Understand the Requirements and Watch for Loose Attachments 18
Owner-Maintenance 19
TSB Aviation Safety Advisory: Insufficient Fuel Delivery Following Installation or Modification of Fuel System 21

Emergency Locator Transmitter (ELT) Maintenance: Understand the Requirements and Watch for Loose Attachments

The purpose of this article is to underscore the importance of observing proper ELT maintenance requirements and installation practices. This article also aims to inform manufacturers, owners, operators and maintainers of aircraft with fabric hook and loop ELT retention systems of the need to ensure adequate ELT retention in order to reduce the risk of potentially damaging the unit in the event of an accident.

An ELT is designed to detect that a crash has occurred and transmit a specific distress signal that is powerful enough to be detected by search and rescue authorities. In order to maintain ELT system reliability, there are maintenance requirements that need to be performed at specified intervals. These requirements are part of an aircraft's approved maintenance schedule.

Non-water activated ELTs should be inspected at intervals not exceeding 12 months. ELTs powered by water activated batteries should be inspected at intervals not exceeding 5 years. Maintenance of an ELT system is typically carried out during an aircraft inspection phase. The inspection consists of an on-aircraft inspection, performance test, corrosion check, battery expiration verification, reinstallation of the ELT after maintenance and an operational check. The individuals performing these maintenance activities shall use the most recent methods, techniques, practices, parts, materials, tools, equipment and test apparatuses specified in the ELT manufacturer's instructions, in equivalent instructions or in accordance with recognized industry practices. The ELT test equipment used to validate the performance of the ELT must meet the manufacturer's specifications. Where the calibration specifications are published by the ELT manufacturer, the test equipment shall be calibrated by means traceable to a national standard.

Note: *The ELT performance test must be done by an avionics-rated aircraft maintenance organization (AMO) with a radio rating and with the specific ELT model on its capability list.*

Fasteners and attachments

Each ELT manufacturer has their own unique method of fastening the ELT to the aircraft. Due to the different types of fasteners like thumbscrews, metal latches, fabric hooks and loops, etc., the person performing the reinstallation should refer to the manufacturer's instructions for guidance. It is essential that the ELT does not come loose or get ejected from its tray during a crash. Such a situation could cause the ELT to stop functioning and result in an unsafe situation that prevents the ELT from transmitting as designed.

Such a situation was discovered in a recent investigation by the Transportation Safety Board of Canada (TSB) following an accident, which is summarized in the "Recently Released TSB Reports" section of this issue of the *Aviation Safety Letter* (TSB Final Report A11W0151). The TSB noted during the field examination that the ELT was out of its mounting tray and hanging by the antenna cable. The remote control panel wires were broken near the ELT plug, and the antenna had been broken off by ground contact. As a result, no ELT signal was recorded by search and rescue (SAR) authorities nor was a 121.5 MHz signal received by SAR aircraft, even though the ELT was found to be operating when rescuers arrived on site.

The type of mounting system used on the accident flight consists of a rectangular composite tray affixed to the aircraft. The ELT rests within a raised box structure that goes around the perimeter of the mounting tray and is secured by a fabric strap featuring a Velcro™ hook and loop system. When the strap is tight, the ELT is firmly held in the mounting tray box (see Photo 1).

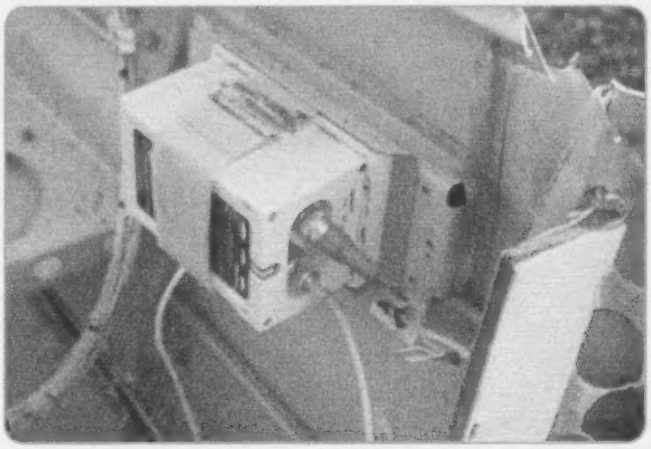


Photo 1: Properly mounted ELT with strap tightened

Field examination of the ELT and mounting bracket revealed that the retention strap was loosely fastened, and that it was possible to slide the ELT under the strap and back into its mount (see Photo 2). The unit could be easily removed in the same manner. Shortening the strap by ¾ inch

tightened it around the ELT and secured the ELT to the bracket so that it could not be manually removed without loosening the strap.

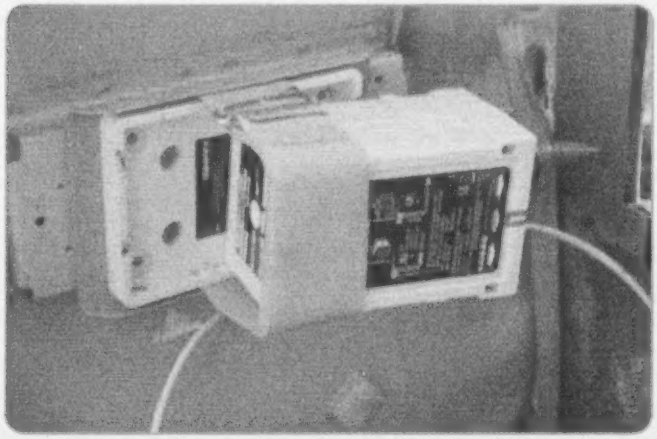


Photo 2: ELT sliding under loose strap

The manufacturer's instructions direct installers to align the strap buckle with the centre line of the unit and "fasten the self-stripping strap tightly". There is no further definition of the degree of strap tightness required to adequately secure the ELT to the mounting tray. The subjective judgment of the installer is relied upon to make this determination.

As demonstrated in this occurrence, without clear instructions describing what constitutes a secure ELT installation, there is a risk that ELTs will be installed without sufficient strap tightness. During an accident, this may cause the ELT to fall out of its mount and separate from its antenna cable. Such an occurrence could prevent transmission of a distress signal, resulting in a delay of search activity, difficulty in locating the aircraft and delay in the rescue of occupants. This delay could adversely affect the level of occupant injury and survival. It could also cause the unnecessary diversion of search and rescue resources.

New standard for 406 MHz ELTs

The Federal Aviation Administration (FAA) has determined that hook and loop fasteners are not an acceptable means of compliance to meet the mounting and retention requirements of technical standard orders (TSOs) for 406 MHz ELTs. As a result, on November 26, 2012 the FAA issued TSO-C126b which, among other requirements, withdraws TSO authorizations (TSOA) issued for the manufacture of automatic fixed (AF) and automatic portable (AP) 406 MHz ELTs which incorporate hook and loop fasteners in their design. This TSO affects only new applications submitted after its effective date. Transport Canada plans to adopt TSO-C126b by reference into the Airworthiness Manual (AWM) to become a CAN-TSO-C126b design standard.

While it appears that hook and loop fasteners will gradually disappear, they may be around for a while yet. It is therefore important to follow the aircraft's maintenance schedule and consult the ELT manufacturer's instructions for additional information, such as how to properly install the ELT. Proper care of and attention to an ELT system remains the best way to safely locate a downed aircraft. △

Owner-Maintenance

by Brian Clarke, Civil Aviation Safety Inspector, Operational Airworthiness, Standards, Civil Aviation, Transport Canada

Aircraft owners can apply to have their aircraft's 'normal' certificate of airworthiness replaced by a Special Certificate of Airworthiness - Owner-maintenance. When an aircraft is in the owner-maintenance classification the aircraft owner—if they are a pilot—can perform and release maintenance on their own aircraft.

The first Special Certificate of Airworthiness - Owner-maintenance was issued in 2002 and there are now about 550 owner-maintenance aircraft registered, out of a Canadian non-commercial fleet of over 20 000 aircraft. The program is clearly not wildly popular, perhaps because owner-maintenance aircraft are not allowed by the Federal Aviation Administration (FAA) to fly in the United States. Nevertheless, questions to Transport Canada Civil Aviation (TCCA) related to owner-maintenance are frequent. The purpose of this article is to review some of the significant specifics on the subject of the owner-maintenance classification.

Under *Canadian Aviation Regulations* (CAR) Standard 507.03(6), the Special Certificate of Airworthiness - Owner-maintenance was established to allow the non-commercial use and enjoyment of relatively simple, generally older aircraft for which certified parts were scarce and support from the manufacturer limited. After the classification had been in place for a few years, owners of owner-maintenance aircraft were granted a Ministerial Exemption to CAR 605.03(1)*(a)*, *(b)* and *(c)*—the requirement to have and carry a Certificate of Airworthiness. The exemption has the effect of allowing flight of an owner-maintenance aircraft that is no longer in conformity with its type certificate, and thus allows some degree of modification of the aircraft and the installation of equipment that was not specified by the manufacturer. The letter of exemption is carried aboard the aircraft and effectively becomes the aircraft's airworthiness certificate. We refer to aircraft with a Special Certificate of Airworthiness - Owner-maintenance and those flying under the Exemption as "owner-maintenance classification" aircraft.

Owner-maintenance aircraft, just like other aircraft, have to be continuously maintained in accordance with a maintenance schedule conforming to CAR 605.86. Some maintenance tasks required by the schedule may require skills or equipment that the owner/pilot does not have; when the owner/pilot is not qualified or equipped to perform a required task, he or she can and should contract the work to a qualified person or organisation. In these instances, an Aircraft Maintenance Engineer (AME) or Approved Maintenance Organisation (AMO) can and should perform and release work on owner-maintenance classification aircraft.

Maintenance on owner-maintenance aircraft has to be performed in accordance with CAR 571.02, which calls for proper practices and use of the correct tools, manuals and instruments; records have to be kept in accordance with CAR 507.03 and 605.92. All modifications and repairs to owner-maintenance aircraft must be performed in accordance with at least "acceptable data", as defined in CAR Standard 571.06. This may seem a lower bar than the "approved data" or "specified data" required for major modifications to aircraft maintained to a "non-Special" Certificate of Airworthiness, but it does not allow the unfettered installation of inappropriate parts or radical modifications.

CAR Standard 507.03(6)*(e)* lists the eligibility conditions for the owner-maintenance classification. An owner-maintenance aircraft cannot be modified beyond those limits. For instance, a constant speed propeller or amphibious floats cannot be installed on an owner-maintenance or "Exemption" aircraft, because the aforementioned standard limits eligibility to, among other things, aircraft with fixed pitch props and fixed landing gear. Significant modifications that affect the structural strength, performance, power plant operation, or flight characteristics of the aircraft have to be reported to TCCA before flight.

A Civil Aviation Safety Inspector (CASI) who is asked to consider the issue of the letter of exemption, or indeed any flight authority, has to verify that the aircraft is safe for flight. The determination that the aircraft is safe for flight is made by examining records and documents provided by the owner, but the CARs (and normal prudence) do not require that a CASI accept the owner's declarations without review or confirmation. As a delegate of the Minister of Transport, the CASI has the authority to personally inspect or cause to be inspected any aircraft for which an application for flight authority has been made. Any personal inspection by a CASI of an owner-maintenance aircraft will be to the extent necessary to verify that the aircraft is as described in the documentation and is free of obvious defects.

In the simplest case of an aircraft having a valid Canadian Certificate of Airworthiness transitioning to owner-maintenance, a CASI's inspection is very rarely required.

A CASI's inspection will normally be conducted subsequent to unsatisfactory document review or if the aircraft is being imported, has not been operated in the last five years, or does not conform to its type design.

Aircraft can be imported directly into the owner-maintenance classification and an aircraft intended for owner-maintenance that does not meet its type design on import may be issued with the Ministerial Exemption mentioned above. Well-meaning people have come to the mistaken conclusion that the classification and exemption together allow the straightforward import and registration of disassembled aircraft, damaged aircraft and aircraft with incomplete technical records as well as heavily modified aircraft. This is not the case.

Consistent with the import requirements for other aircraft, it is reasonable for the Minister to require that an inspection up to equivalent-to-annual of the imported aircraft be carried out and if necessary that it be carried out by an AME. The CASI may require that a defect list be compiled and cleared, followed by inspecting the aircraft him or herself.

Lastly, it is important to note that while reversal of the owner-maintenance registration is possible it will not be easy or cheap.

Any questions you may have can be directed to a CASI at the Transport Canada Centre (TCC) most convenient to you.

Web links:

Lists of aircraft that have been determined to be eligible for owner-maintenance classification:

www.tc.gc.ca/eng/civilaviation/regserv/cars/part5-standards-a507sh-1837.htm and

www.tc.gc.ca/eng/civilaviation/standards/maintenance-aarpe-recreational-classification-2752.htm

Ministerial exemption to CAR 605.03(1)(*a*), (*b*) and (*c*):
www.tc.gc.ca/CivilAviation/Regserv/Affairs/exemptions/docs/en/1608.htm

CARs: www.tc.gc.ca/eng/civilaviation/regserv/cars/menu.htm

Standard 507.03 — Issue of Special Certificates of Airworthiness
www.tc.gc.ca/eng/civilaviation/regserv/cars/part5-standards-507s-1804.htm#507s_03

CAR 605.86 — Maintenance Schedule
www.tc.gc.ca/eng/civilaviation/regserv/cars/part6-605-2438.htm#605_86

CAR 571.02 — Maintenance and Elementary Work Performance Rules
www.tc.gc.ca/eng/civilaviation/regserv/cars/part5-571-234.htm#571_02

CAR 605.92 — Requirement to Keep Technical Records
www.tc.gc.ca/eng/civilaviation/regserv/cars/part6-605-2438.htm#605_92

Standard 571.06 — Repairs and Modifications
www.tc.gc.ca/eng/civilaviation/regserv/cars/part5-standards-571s-1827.htm#571s_06

To find the nearest TCC: www.tc.gc.ca/eng/regions.htm. △

TSB Aviation Safety Advisory: Insufficient Fuel Delivery Following Installation or Modification of Fuel System

On July 25, 2012, a privately operated Quad City Challenger II advanced ultralight, equipped with a Rotax 582 engine, departed for a test flight from a private airstrip near Port Hope, Ont. During initial climb-out, approximately 18 s after full power application, the engine rpm reduced significantly and the aircraft turned back towards the airstrip. During this turn, the nose dropped steeply, and the aircraft impacted the ground in a wooded area south of the field. The aircraft was substantially damaged and the pilot, the sole occupant, sustained fatal injuries. The following safety-related information is derived from the Transportation Safety Board of Canada (TSB) Class 5 investigation A12O0113.

The aircraft was equipped with a MGL Avionics Enigma electronic flight instrument system (EFIS). This Avionics installation included a fuel flow sensor which contained an optional 1 mm jet orifice. The installation instructions supplied with the sensor describe a fuel flow range of 0.05–0.5 L/min with the 1 mm jet installed. A Rotax 582 engine at full power requires approximately 0.45 L/min.

The TSB could not determine if an adequate functional check of the aircraft fuel system had been completed prior to the occurrence flight. However, during a series of post-accident engine test runs, it was determined that a Rotax 582 engine, with the stock pneumatic fuel pump installed as it was on the occurrence aircraft, was only able to draw 0.24 L/min through the 1 mm orifice. As such, the engine was unable to run at full power for longer than 20 s.

The TSB notified the related avionics, airframe and engine manufacturers of the deficiency. MGL Avionics has released a Safety Notice regarding the Installation of Restrictor Jets in the Plastic Fuel Flow Sensor informing their customers not to use the 1 mm orifice without contacting MGL Avionics. The company now recommends using the 2 mm orifice for Rotax installations. However, the Rotax 582 installation manual calls for fuel lines with a minimum diameter of 5 mm and includes the instruction to never restrict normal fuel flow.

This fuel restriction disparity may not be limited to the manufacturers listed above and may be more widespread in the non-certified aircraft community. As this occurrence demonstrates, a functional check of the aircraft fuel system ought to be performed following a modification or new installation. Without such a check, pilots may attempt to operate aircraft with insufficient fuel delivery, thereby increasing the risk of engine failure. Awareness of this issue in the aviation community will hopefully help reduce the risk of a similar recurrence. △

Invest a few minutes into your safe return home this summer...

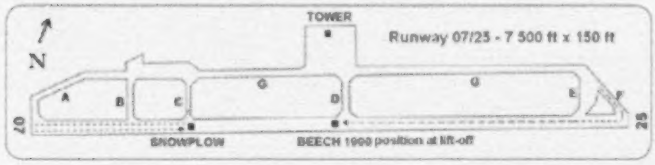
...by reviewing important information on the use of the **Pressure Altimeter**, in Section AIR 1.5 of the *Transport Canada Aeronautical Information Manual* (TC AIM).

Recently Released TSB Reports

The following summaries are extracted from final reports issued by the Transportation Safety Board of Canada (TSB). They have been de-identified and include the TSB's synopsis and selected findings. Some excerpts from the analysis section may be included, where needed, to better understand the findings. For the benefit of our readers, all the occurrence titles below are now hyperlinked to the full TSB report on the TSB Web site. —Ed.

TSB Final Report A09W0026—Runway Incursion/Risk of Collision

On February 9, 2009, at 21:11 MST, a Beech 1900D aircraft, with two crew members and eighteen passengers on board, was taking off from Runway 25 at Fort McMurray Airport, Fort McMurray, Alta. Visibility at the time was reported as ⅝ SM in light snow. Just before reaching the takeoff decision speed/rotation speed, the crew noticed headlights on the runway in front of them and rotated immediately. The aircraft passed about 100 to 150 ft over a snowplow operating on the runway. The snowplow operator had been cleared by the flight service specialist to continue snow clearing operations on Runway 25 after a previous departure. The snowplow operator had not been instructed to vacate the runway prior to the Beech 1900's departure, and the crew of the aircraft had not been advised of the presence of the snowplow on the runway. The Beech 1900 crew was communicating with the flight service station (FSS) on the mandatory frequency (MF) of 118.1 MHz, whereas the snowplow operator was communicating on the ground frequency of 121.9 MHz.



Fort McMurray Airport diagram

Analysis

The consequences of a collision between ground vehicles and aircraft taking off or landing can be catastrophic. As a result, several defences are used to prevent ground vehicles and aircraft from conflicting with each other.

The specialist was relatively busy, communicating with airport traffic and coordinating with the area control centre (ACC). The specialist did not remember clearing the vehicle back onto the runway after the previous departure. It is likely that the other tasks, at around the same time the specialist was clearing the vehicle onto the runway, interrupted the specialist's normal use of available aide memoires. Furthermore, the position of the vehicle in and around Taxiway C likely confirmed in the specialist's mind that the vehicle had not moved since the previous departure, and that a clearance had not been given to the vehicle to proceed back onto the runway.

Transport Canada regulations require pilots to ensure that the runway is clear of obstacles prior to departure. This can be done by visual observation or through radio communications. In this case, it was night with reduced visibility in snow, which limited the effectiveness of visual observation.

Having both the aircraft pilot and the vehicle operator on the same radio frequency would have likely enhanced each other's awareness of their respective positions on the runway.

Findings as to causes and contributing factors

1. Likely due to the interruption from other tasks at the same time the specialist was clearing the vehicle onto the runway, the flight service specialist did not use any aide memoires as a reminder that the snowplow had been cleared onto the runway.
2. The flight service specialist's visual scan was defeated by reduced visibility.
3. The reduced visibility due to darkness and falling snow resulted in neither the vehicle operator nor the pilot accurately determining the other's position on the runway.
4. The snowplow and the Beech 1900 were operating on different frequencies, removing an opportunity for the flight crew or the vehicle operator to be aware of the other's presence on the runway.

Safety action taken

Transportation Safety Board of Canada

On August 13, 2009, the Transportation Safety Board of Canada issued to Transport Canada an Aviation Safety Advisory A09W0026-D1-A1, entitled Communication Frequency Assignment for Vehicle Advisory Services. This advisory suggests that Transport Canada may want to work with NAV CANADA to explore the feasibility of a single frequency for the aircraft and vehicles occupying the manoeuvring areas.

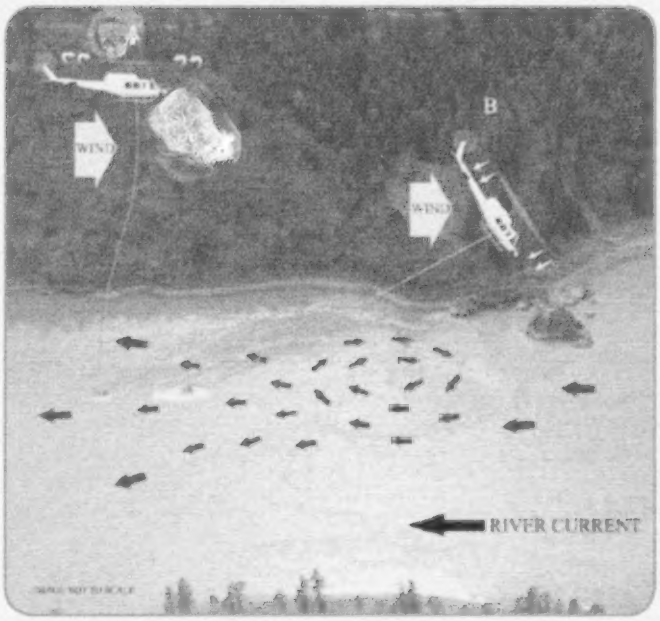
NAV CANADA

In response to the above-mentioned Safety Advisory, NAV CANADA provided the following:

- On February 26, 2009, NAV CANADA published Squawk 7700 (2009-2) titled *Reducing the risk of runway incursions*. It provides the latest runway incursion statistics and reminders on some of the actions that air traffic services (ATS) personnel can take to reduce the likelihood of being involved in a runway incursion.
- NAV CANADA conducted an Operational Safety Investigation (OSI) into the event. In the weeks following the release of its investigation report, NAV CANADA examined the possibility of implementing cross coupling[1] capability at FSS as a potential mitigation to reduce the likelihood of similar occurrences.
- On April 27, 2009, a memorandum on the implementation of cross coupling was distributed. It provided directions to unit managers of FSS facilities to implement the cross coupling capability, proceed with an on-site implementation safety review, include procedures on the use of cross coupling in the Unit Operations Manual (UOM) and provide a mandatory briefing for specialists. Flight Services (FS) evaluations and investigations inspectors are verifying the implementation of cross coupling in all units as part of their routine unit evaluations.
- Since the incident, there have been changes in the ATS provision at the Fort McMurray Airport (YMM). An air traffic control (ATC) tower has been established and, outside the tower's hours of operation, a remote airport advisory service (RAAS) through Peace River FSS is available. With respect to RAAS, vehicle advisory service is provided on the MF, which is a single frequency for both vehicle operators and aircraft.

TSB Final Report A09P0249—Loss of Control—Collision with Water

On August 14, 2009, a Bell 212 helicopter was engaged in firefighting operations about 20 NM south of Lillooet, B.C. At approximately 16:02 PDT, the accident helicopter approached the Fraser River to pick up water. Shortly before reaching the pickup location, the helicopter descended unexpectedly and its water bucket, on a 150-ft longline, touched down in a fast flowing section of the river. As the helicopter continued forward, it was dragging the water bucket. Moments later, the helicopter pitched nose-down, yawed to the left, struck the river surface, broke up, and sank. The pilot escaped the wreckage and was swimming in the fast flowing water. Repeated attempts to rescue the pilot by other helicopters in the area proved unsuccessful. The pilot's body was found downstream five days later. Some pieces of the wreckage, including the longline and water bucket, were retrieved, but the majority of the wreckage was not recovered.



Accident sequence (VRS followed by bucket anchoring)

Analysis

The helicopter was not recovered; however, it is believed that mechanical malfunctions were not a factor in this accident. Therefore, the analysis focuses on the canyon winds, helicopter aerodynamics, operational factors and post-crash survival.

Because of the local topography, the wind direction changed 180° in a short time. This may have happened without a decrease in wind speed and, because of the barren land and rough water, the wind direction would have been hard to identify.

The tight circuit just before final approach—likely for spacing—put the helicopter in a position that would have necessitated a steep approach, requiring careful power management. It is likely that the accident pilot's approach was unknowingly conducted with a tailwind, due to the sudden change in wind direction. This would have caused the helicopter to lose translational lift early on the approach, likely producing a sudden increase in the rate of descent. To counter this descent, the pilot would have to add power. The combination of a steep approach, unknowingly conducted downwind at slow speed with power applied, likely caused the helicopter to descend into its own downwash. This would have caused the helicopter to enter a vortex ring state (VRS) and produced a rapid descent. The VRS condition and/or the attempt to recover by gaining airspeed or lowering the collective caused the water bucket to drop into the river before reaching the back eddy (see image, position A).

1 Cross coupling of frequencies allows aircraft and vehicles to hear communications coming from each other and the specialists even when these communications take place on the frequency that they do not monitor, thus increasing their situational awareness of other vehicle and aircraft relative positions and intentions.

In an attempt to recover from VRS, the pilot would have pushed the cyclic forward to gain airspeed. However, the water bucket would have been full and drifting downstream, opposite to the direction of flight. This would have produced an anchor-like effect on the helicopter, causing it to pitch nose-down (see image, position B). The pilot would have quickly run out of aft cyclic travel while trying to raise the nose, causing the helicopter to fly in a descending arc until it collided with the water.

If the pilot had released the longline before he ran out of aft cyclic travel, he would likely have been able to fly away without losing control.

It is impossible to ascertain whether or not the pilot attempted to release the water bucket before the crash. Because he was known to disarm the release switch, the pilot would not have been able to electrically release the water bucket. The left yaw that occurred just prior to impact could be attributed to a last second attempt to jettison the longline and water bucket. In doing so, the pilot probably took his right foot off the right anti-torque control pedal to activate the manual belly hook release. This would make it very easy to induce a left pedal input that caused the helicopter to yaw left.

Findings as to causes and contributing factors

1. The combination of a steep approach, unknowingly conducted downwind at slow speed with power applied, likely caused the helicopter to enter a VRS.
2. During the pilot's attempt to recover, the water bucket dropped into the flowing river and acted as an anchor, causing the helicopter to pitch nose-down and collide with the water.
3. The helicopter was likely being operated with the belly hook electrically disarmed, limiting the pilot's ability to jettison the water bucket before losing control.
4. Although the pilot was able to escape the helicopter wreckage in the water without injury, he was not wearing a personal flotation device (PFD) and drowned.

Findings as to risk

1. The helicopter's manual emergency release for an external load requires the pilot to remove one foot from the anti-torque control pedals. As a result, there is an increased risk of loss of anti-torque control at a critical time of flight.
2. Operations in deep canyons may be subject to turbulent airflow and winds that rapidly flip from one direction to the opposite. Without adequate warning, helicopter pilots may be placed at risk.

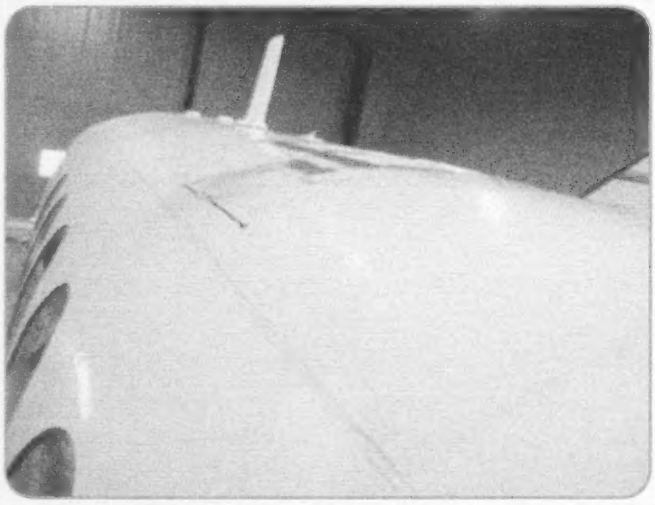
Safety action taken

Operator

Immediately following the accident, the helicopter operator instituted policies requiring pilots to fly with the belly hook armed and to wear PFDs when water bucketing.

TSB Final Report A10Q0019—Cabin Fire

On January 2, 2010, a Beech 200, with two pilots and four passengers on board, conducted an IFR medical evacuation (MEDEVAC) flight between La Romaine Airport and Sept-Îles Airport in Quebec. While the aircraft was approximately 5 NM from landing on Runway 09 at Sept-Îles, one of the passengers informed the flight crew that there was smoke in the cabin. The crew switched off the fluorescent lights in the cabin, the ordinance lights and the two air bleed systems. The smoke appeared to dissipate. The aircraft touched down at 12:39 EST and taxied to the company's facilities. Once the aircraft came to a stop, some smoke reappeared. Emergency services were alerted. The crew was unable to locate the source of the fire until it became visible from outside the cabin, on the top left of the fuselage. The crew extinguished the fire using portable fire extinguishers. There were no injuries. The aircraft was significantly damaged.



Damage as seen from outside the aircraft

Analysis

The flight crew was notified of the presence of smoke while performing an approach in instrument flight conditions. The crew was faced with an emergency during a critical phase of flight. Although the crew had little time to assess the situation and take appropriate action before landing, the first officer went to the rear of the aircraft to better assess the situation.

He observed the presence of grey smoke, normally associated with an electrical problem, but the applicable emergency procedures were not followed. Two factors may have influenced the flight crew to not follow the emergency procedures:

- The smoke appeared to dissipate as a result of the initial actions taken, namely the switching off of the fluorescent lights, the ordinance sign lights and the closing of the two air bleed systems;
- The crew had little time to locate and apply the emergency procedures before landing.

It is difficult to predict what the outcome would have been had the flight crew applied the emergency procedures on a timely basis. However, in the case of this occurrence, shutting off non-essential electrical equipment, such as fluorescent lights and ordinance sign lights, was done as soon as the passenger informed the crew of the presence of smoke. Therefore, electrical power was cut sooner than if the crew had taken the time to read the paragraph to identify the source of the smoke and get to point 7, which states to cut the electrical power to non-essential equipment.

Declaring an emergency at the right time and clearly indicating the nature of the problem allows crews to get the best possible assistance when faced with an abnormal or emergency situation. Without this information, unexpected and undesirable consequences could occur, for example, a pilot being unable to comply with requests from air traffic control and being forced to execute a missed approach or any other manoeuvre that could delay the landing. In this occurrence, the crew did not deem it necessary to declare an emergency, likely because they thought that they had isolated the source of the problem. However, if the smoke appeared to have dissipated, it was impossible for the crew to know the magnitude of the situation behind the panels.

Findings as to causes and contributing factors

1. Arcing between the connector and electrical power supply of panel LH/4 produced overheating to the point of igniting the fire.
2. The strip of fabric ignited and spread the fire to the air outlet, melted it and burned it completely.

Findings as to risk

1. The surrounding material can ignite in seconds when it is in direct contact with a flame.
2. Not declaring an emergency and omitting to clearly indicate the nature of a problem could produce unexpected and undesirable consequences, which would likely delay landing.

Other finding

The manufacturer, Beech Aircraft Corporation, issued a press release informing operators of the possibility of arcing between the connector and power supply of the fluorescent lights.

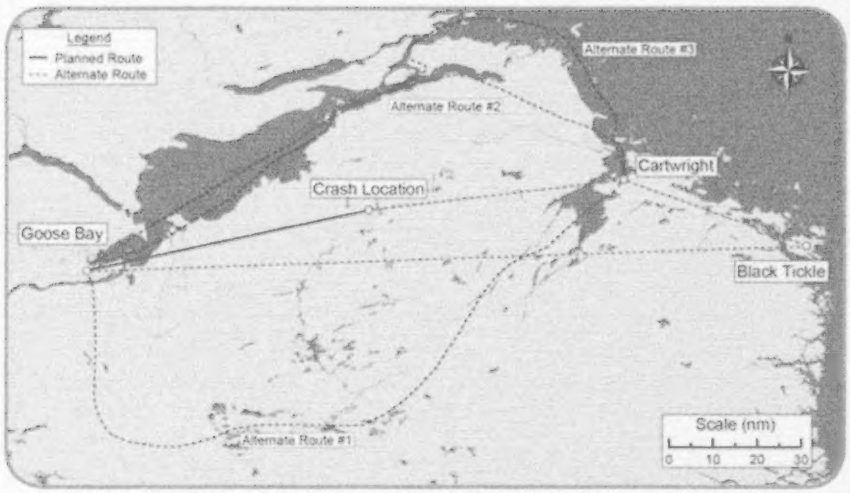
TSB Final Report A10A0056—Controlled Flight Into Terrain

On May 26, 2010, at 08:35 ADT, a Piper Navajo PA31-350 departed on a round trip flight from Goose Bay to Cartwright and Black Tickle before returning to Goose Bay, N.L. The pilot was to deliver freight to Cartwright as well as a passenger and some freight to Black Tickle. At approximately 09:05, the pilot made a radio broadcast advising that the aircraft was 60 NM west of Cartwright. No further radio broadcasts were received. The aircraft did not arrive at destination and, at 10:10, was reported as missing. The search for the aircraft was hampered by poor weather. On May 28, 2010, at about 22:00, the aircraft wreckage was located on a plateau in the Mealy Mountains. Both occupants of the aircraft were fatally injured. The aircraft was destroyed by impact forces and a post-crash fire. There was no emergency locator transmitter (ELT) on board and, as such, no signal was received.

Route

The pilot planned and flew the most common route from Goose Bay to Cartwright, which is direct. However, weather conditions may require flying around the Mealy Mountains. Pilots who routinely fly the coast of Labrador choose any one of the following alternate routes:

- Alternate Route 1: Follow the Kenamu River Valley until south of the Mealy Mountains, then proceed eastward and follow the Eagle River.
- Alternate Route 2: Proceed northeast from Goose Bay along the south shore of Lake Melville to Frenchman Point, then



The pilot was flying VFR direct to Cartwright in weather conditions where he would have encountered lowering ceilings and reduced visibility en route towards the Mealy Mountains.

follow the English River to the North River, which can be tracked to the coast.

- Alternate Route 3: Fly to Lake Melville and through the Narrows to the coast proceeding down the shoreline to Cartwright.

Analysis

The aircraft had no deficiencies that precluded normal operation. Pilot incapacitation was ruled out; there was no indication of any health-related matters during the pilot's last radio communication, just prior to the aircraft impacting the terrain.

The investigation also determined that turbulence was not a factor contributing to the aircraft striking the ground. If turbulence forced the aircraft down into the mountain, the debris field would consist of an initial impact point with debris spread about in multiple directions. In this occurrence, the left engine cowling was dragged through the snow for 40 ft, and the aircraft continued in a straight line for an additional 370 ft before coming to a stop. The majority of the debris was contained within a confined area.

At the time of departure, the pilot was aware that the altimeter setting was 29.93 in-Hg in Goose Bay and 29.71 in-Hg in Cartwright. The planned route would take the aircraft over rising terrain and toward an area of lower pressure. Therefore, if left untouched, the altimeter would have read approximately 200 ft higher than the actual altitude of the aircraft. The last radar return showed the aircraft at 3 600 ft ASL. If the altimeter was reading 200 ft higher than the actual altitude, as a result of the pilot not having adjusted it to Cartwright's setting, then the aircraft would have been flying at an actual altitude of about 3 400 ft.

Although the aircraft was extensively damaged, there was no evidence suggesting a problem with the flight controls or engines. Initial impact signatures and the debris field suggest that there was no attempt made to avoid the terrain. The pilot was flying VFR direct to Cartwright in weather conditions where he would have encountered lowering ceilings and reduced visibility en route towards the Mealy Mountains.
If the pilot entered cloud or an area of low visibility, then he likely would have lost visual reference with the horizon due to the snow covered mountains, and would have had to rely on his altimeter to maintain clearance with terrain. The aircraft initially struck the ground at about 3 450 ft, which is consistent with the altitude of the last radar contact if the pilot had not set the altimeter to Cartwright's setting. The aircraft flew into the rising terrain in a straight and level attitude with the engines running, consistent with controlled flight into terrain (CFIT).

The pilot had extensive experience flying in Labrador, and the forecast weather conditions for the en route portion of the flight were marginal VFR. It could not be determined why the pilot chose to fly this route when alternatives were available.

Findings as to causes and contributing factors

1. The pilot conducted a VFR flight into deteriorating weather in a mountainous region.
2. The pilot lost visual reference with the ground and the aircraft struck the rising terrain in level, controlled flight.

Findings as to risk

1. When an aircraft is not equipped with a functioning ELT, the ability to locate the aircraft in a timely manner is hindered.
2. Not applying current altimeter settings along a flight route, particularly from an area of high to low pressure, may result in reduced obstacle clearance.
3. Without a requirement for terrain awareness warning systems, there will be a continued risk of accidents of this type.

TSB Final Report A10Q0087—Collision with Water

On June 3, 2010, at approximately 19:00 EDT, a privately operated Lake Buccaneer LA-4-200 amphibious aircraft, with the pilot and a passenger on board departed on a VFR

flight from Lac de la Marmotte II to Baie Comeau, Que. The 98-NM flight was to take approximately 1.3 hr. When the aircraft did not arrive at its destination by the end of day on June 4, a search was started on the morning of June 5. Using sonar, the aircraft was located on June 26 by the Sûreté du Québec police dive team at a depth of 230 ft in Lac Berté, 5 NM south of Lac de la Marmotte II. The aircraft and occupants were recovered on July 2 and 3, 2010, with the assistance of a remotely operated vehicle with underwater camera. The aircraft was substantially damaged on impact with the surface of the water. The pilot and passenger were seriously injured and drowned. No emergency locator transmitter (ELT) signal was detected by the search and rescue system.

Lake Buccaneer

Analysis

Two possible scenarios resulting in the collision with water were considered: a missed precautionary or emergency landing due to aircraft operation difficulties and glassy water conditions, or a loss of control of the aircraft due to pilot or passenger impairment. Risk factors that may have increased the likelihood of sudden impairment were considered for both the pilot and the passenger; both were at risk of a sudden medical event.

The first possible scenario is that the aircraft had some system malfunction that was not determined during the post-accident examination. However, this scenario would not explain why the pilot, with much experience landing on water, and with ample space on Lac Berté to make a precautionary landing, was not able to land the aircraft safely on the water. The pilot's experience and skill level should have been sufficient to handle such an event.

The second scenario is a sudden medical event resulting in pilot or passenger impairment while in flight over Lac Berté. Both the pilot and the passenger had pre-existing health risk factors, making it possible that either one of them may have experienced a medical event resulting in some degree of impairment, possibly leading to distraction and/or a loss of control of the aircraft. The investigation could not determine if either the pilot or the passenger experienced an incapacitating medical event, and there was insufficient factual information to conclusively state why the aircraft descended and impacted the water.

Findings as to causes and contributing factors

1. It could not be determined why the aircraft descended and struck the surface of the water.
2. The pilot and passenger seats failed when the aircraft floor was torn open on impact. The lack of effective occupant restraint during the impact sequence likely contributed to the severity of their injuries, rendering them unconscious and unable to survive the post-crash water environment.

Findings as to risk

1. Once an ELT is submerged, a signal cannot be transmitted through water, delaying initiation of rescue efforts.
2. Not wearing shoulder harnesses increases the risk of serious injury to the head and upper torso in the event of an accident, which in turn may prevent a safe exit from the aircraft.

TSB Final Report A10W0171 — Stall on Approach/Loss of Control

On October 25, 2010, a Beech 100 was on an IFR flight from Edmonton City Centre Airport to Kirby Lake, Alta. At approximately 11:14 MDT, during the approach to Runway 08 at Kirby Lake Airport, the aircraft struck the ground, 174 ft short of the threshold. The aircraft bounced and came to rest off the edge of the runway. There were two flight crew members and eight passengers on board. The captain sustained fatal injuries. Four occupants, including the co-pilot, sustained serious injuries. The five remaining passengers sustained minor injuries. The aircraft was substantially damaged. A small, post impact electrical fire in the cockpit was extinguished by survivors and first responders. The emergency locator transmitter (ELT) was activated on impact.

Analysis

The analysis focuses on crew performance inside the cockpit, while engaged in non-operational conversation, and outside of the cockpit, in particular with regard to both pilots' attention being on obtaining visual reference to the runway at the expense of monitoring the aircraft.

During the initial stages of the approach to Kirby Lake, the crew was engaged in a conversation that did not directly pertain to the operation of the flight. The casual nature of the conversation between the pilot flying (PF) and pilot not flying (PNF) suggests that they were not overly concerned with the approach and may not have been at a heightened level of attention. While a majority of the standard operating procedure (SOP) and checklist items were completed during the approach, a number of critical items, such as descending below the minimum sector altitude while diverting to the XIKIB waypoint and failing to announce/confirm arrival at the minimum descent altitude (MDA), were indicative of lapses in cockpit discipline.

Beyond the distraction within the cockpit, the crew was faced with the additional task of identifying the runway. Although the company SOP did not specify when the PNF should look outside, the automated weather observation system at Kirby Lake indicated that the visibility was 4 SM in light snow. This likely prompted the PNF to look outside of the cockpit at a GPS distance of 4 NM and to identify the runway. This declaration prompted the PF to look up from monitoring the flight instruments in an attempt to identify the runway. For the remainder of the flight, both crew members were focused outside the cockpit. With neither pilot monitoring the airspeed and altitude, the aircraft continued to descend. From the initial identification of the runway, the airspeed decreased to a point that it entered an aerodynamic stall. The aircraft was, however, too low to effect a recovery, despite attempts by the crew to do so.

The loss of control of the aircraft was likely the result of a stall or near stall condition. The ground speed determined by the propeller marks and the high engine power setting during the attempted recovery indicate that the aircraft was in a low energy state. The aircraft's close proximity to the ground prevented a full recovery from the loss of control.

Pilots are often expected to perform a number of concurrent activities. In this case, this involved flying and monitoring the aircraft as well as visually acquiring the runway. During these multi-tasking situations, the crew may prioritize activities based on their perceived level of importance. In this case, the act of visually finding the runway was categorized as being of primary importance. As such, the crew's cognitive efforts were directed to this activity at the expense of monitoring the aircraft's flight profile.

The aircraft was equipped with a stall warning system, which did not activate prior to the aircraft entering a low energy state. The aircraft's wing de-icing system appeared to be functional throughout the approach, and the post impact inspection of the aircraft did not indicate an accumulation of ice on the critical flight surfaces. The investigation was unable to determine why the stall warning system did not activate.

Findings as to causes and contributing factors

1. The conduct of the flight crew members during the instrument approach prevented them from effectively monitoring the performance of the aircraft.
2. During the descent below the minimum descent altitude, the airspeed reduced to a point where the aircraft experienced an aerodynamic stall and loss of control. There was insufficient altitude to effect recovery prior to ground impact.
3. For unknown reasons, the stall warning horn did not activate; the horn could have provided the crew with an opportunity to avoid the impending stall.

Findings as to risk

1. The use of company standard weights and a non-current aircraft weight and balance report resulted in the flight departing at an inaccurate weight. This could result in a performance regime that may not be anticipated by the pilot.
2. Flying an instrument approach using a navigational display that is outside the normal scan of the pilot increases the workload during a critical phase of flight.
3. Flying an abbreviated approach profile without applying the proper transition altitudes increases the risk of controlled flight into obstacles or terrain.
4. Not applying cold temperature correction values to the approach altitudes decreases the built-in obstacle clearance parameters of an instrument approach.

Safety action taken

The operator has taken the following safety actions:

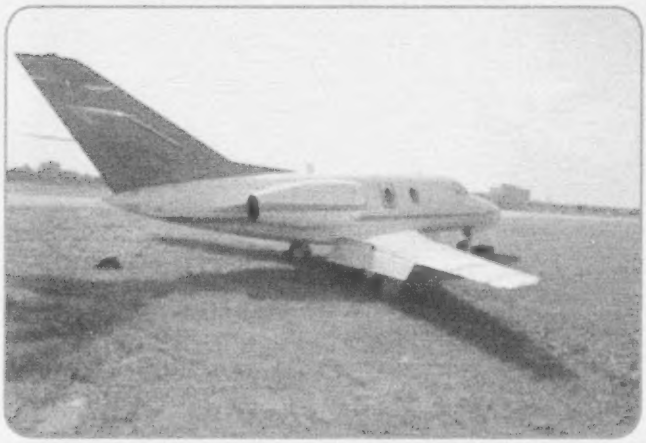
- Amended the weight and balance calculation procedure to require flight crews to confirm the correct aircraft configuration and passenger weights.
- Implemented a company line check program that includes *Canadian Aviation Regulations* 703 and 704 operations to ensure adherence to SOP, including sterile cockpit procedures.
- Developed and implemented a procedures review exam for flight crew, emphasizing SOP and company procedures for stabilized approaches, sterile cockpit, and crew roles and

duties during non-precision approaches at remote airports with limited services.

- Amended company SOP and placarded aircraft equipped with a Garmin 155XL regarding conducting GPS approaches. These approaches will be flown from the left seat only.

TSB Final Report A11O0098—Runway Excursion

On June 17, 2011, a Dassault Falcon 10 was on a flight from Toronto/Lester B. Pearson International Airport to Toronto/Buttonville Municipal Airport, Ont., with two pilots on board. Air traffic control (ATC) cleared the aircraft for a contact approach to Runway 33. During the left turn on to final, the aircraft overshot the runway centreline. The pilot then compensated with a tight turn to the right to line up with the runway heading and touched down just beyond the threshold markings. Immediately after touchdown, the aircraft exited the runway to the right, and continued through the infield and the adjacent Taxiway Bravo, striking a runway/taxiway identification sign, but avoiding aircraft that were parked on the apron. The aircraft came to a stop on the infield before Runway 21/03. The aircraft remained upright, and the landing gear did not collapse. The aircraft was substantially damaged. There was no fire, and the flight crew was not injured. The Toronto/Buttonville tower controller observed the event as it progressed and immediately called for emergency vehicles from the nearby municipality. The accident occurred at 15:06 EDT.



Analysis

The investigation determined that the aircraft was serviceable and that there were no maintenance defects that affected the aircraft during the flight. Also, crew fatigue and weather conditions did not contribute to this occurrence. Therefore, the investigation focused on the manner in which the aircraft was flown prior to touchdown on Runway 33, and the procedures followed by the crew in this occurrence.

Considering the entire flight was approximately 6 min in duration and below 4 000 ft ASL, there was no need to fly at the speeds attained during the flight. Although radar indications provided ground speed values, it was determined that, even after the conversions to indicated airspeed values, the aircraft was flown in excess of the current regulations and the operator's standard operating procedure (SOP).

The excessive speed and the fact that the crew did not routinely fly this route or other short routes reduced the amount of time available to perform all the tasks dictated by the company SOP, the required checklist items and the approach briefing. This resulted in the crew flying an unstabilized approach.

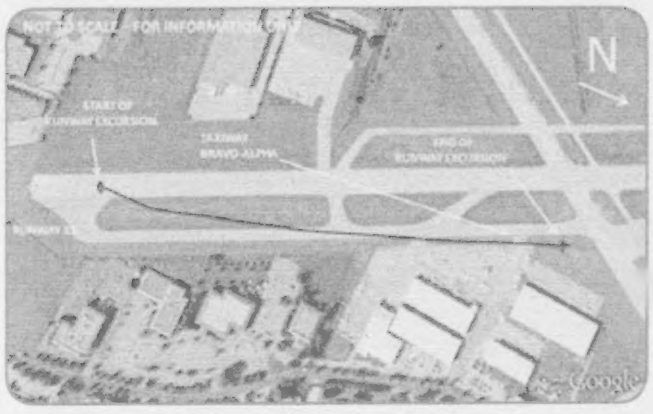
ATC requested that the flight crew keep the circuit tight. Because of its excessive speed, however, the aircraft overshot the final approach track. The radar display indicated that the aircraft transitioned through the final approach course at approximately 140 kt. Consequently, a left turn was performed exceeding 30° of bank, well above the SOP limit and outside the Flight Safety Foundation (FSF) criteria for a stabilized approach. The distance to the runway threshold continued to reduce quickly, and manoeuvres to regain runway heading became more aggressive and non-standard.

The first officer (FO) called for a missed approach using non-standard wording. The ground proximity warning system (GPWS) aural alert sounded twice. Either of these should have prompted the captain to perform a missed approach. The non-standard wording and the tone used by the FO were insufficient to deter the captain from continuing the approach. The captain's commitment to landing or lack of understanding of the degree of instability of the flight path likely influenced the decision not to conduct a missed approach.

Full flaps were called for by the captain on final approach and subsequently selected by the FO. The flaps reached full extension approximately 13 s afterwards, when the aircraft was about 40 ft above the runway.

Just prior to touchdown, the FO called for engine power, likely to arrest the high rate of descent. The captain did not increase engine power, and the aircraft touched down hard. Attempts at rudder steering and braking were ineffective in reducing speed and providing directional control, as tire traction would have been greatly reduced on the grass surface.

As the aircraft exited the infield and entered the paved Taxiway Bravo, the brakes regained effectiveness. However, directional control was not fully regained, and the aircraft struck the runway/taxiway identification sign before exiting Taxiway Bravo onto the grass infield.



Runway excursion diagram

Findings as to causes and contributing factors

1. The crew flew an unstabilized approach with excessive airspeed.
2. The lack of adherence to company SOP and crew resource management, as well as the non-completion of checklist items by the flight crew contributed to the occurrence.
3. The captain's commitment to landing or lack of understanding of the degree of instability of the flight path likely influenced the decision not to follow the aural GPWS alerts and the missed approach call from the FO.
4. The non-standard wording and the tone used by the FO were insufficient to deter the captain from continuing the approach.
5. At touchdown, directional control was lost, and the aircraft veered off the runway with sufficient speed to prevent any attempts to regain control.

Finding as to risk

1. Companies which do not have GPWS procedures in their SOP may place crews and passengers at risk in the event that a warning is received.

Additional info

The TSB provided as an annex to the report the following FSF recommended elements of a stabilized approach:

All flights must be stabilized by 1 000 ft above airport elevation in instrument meteorological conditions (IMC) and by 500 ft above airport elevation in visual meteorological conditions (VMC).

An approach is stabilized when all of the following criteria are met:

1. The aircraft is on the correct flight path;
2. Only small changes in heading/pitch are required to maintain the correct flight path;
3. The aircraft speed is not more than reference landing approach speed (V_{ref}) + 20 kt indicated airspeed and not less than V_{ref};
4. The aircraft is in the correct landing configuration;
5. Sink rate is no greater than 1 000 ft/min; if an approach requires a sink rate greater than 1 000 ft/min, a special briefing should be conducted;
6. Power setting is appropriate for the aircraft configuration and is not below the minimum power for approach as defined by the aircraft operating manual;
7. All briefings and checklists have been conducted;
8. Specific types of approaches are stabilized if they also fulfill the following: instrument landing system (ILS) approaches must be flown within one dot of the glide slope and localizer; a Category II or Category III ILS approach must be flown within the expanded localizer band; during a circling approach, wings should be level on final when the aircraft reaches 300 ft above airport elevation; and
9. Unique approach procedures or abnormal conditions requiring a deviation from the above elements of a stabilized approach require a special briefing. An approach that becomes unstabilized below 1 000 ft above airport elevation in IMC, or below 500 ft above airport elevation in VMC requires an immediate go-around.

Unstabilized approaches are attributed to:

- Fatigue;
- Pressure of flight schedule (making up for delays);
- Any crew-induced or ATC-induced circumstances resulting in insufficient time to plan, prepare and conduct a safe approach. This includes accepting requests from ATC to fly higher/faster or to fly shorter routings than desired;
- ATC instructions that result in flying too high/too fast during the initial approach;
- Excessive altitude or excessive airspeed (e.g., inadequate energy management) early in the approach;
- Late runway change (lack of ATC awareness of the time required by the flight crew to reconfigure the aircraft for a new approach);
- Excessive head-down work (e.g., flight management system [FMS] reprogramming);
- Short outbound leg or short downwind leg (e.g., because of traffic in the area);
- Late takeover from automation (e.g., because the auto pilot [AP] fails to capture the glide slope);

- Premature descent or late descent caused by failure to positively identify the final approach fix (FAF);
- Inadequate awareness of wind conditions, including:
  - Tail-wind component;
  - Low-altitude wind shear;
  - Local wind gradient and turbulence (because of terrain or buildings).
- Recent weather along the final approach path (e.g., wind shift or downdrafts caused by a descending cold air mass following a rain shower);
- Incorrect anticipation of aircraft deceleration characteristics in level flight or on a 3° glide path;
- Failure to recognize deviations or failure to adhere to the excessive-parameter-deviation limits;
- Belief that the aircraft will be stabilized at the minimum stabilization height or shortly thereafter;
- Excessive confidence by the pilot not flying (PNF) that the pilot flying (PF) will achieve a timely stabilization;
- PF-PNF too reliant on each other to call excessive deviations or to call for a go-around; and
- Visual illusions.

TSB Final Report A11W0151—Controlled Flight Into Terrain

On October 4, 2011, a Cessna 208B Caravan departed Yellowknife, N.W.T. at 11:03 MDT under VFR as a regularly scheduled flight to Lutsel K'e, N.W.T. When the aircraft did not arrive at its scheduled time, a search was initiated, and the aircraft was found 26 NM west of Lutsel K'e, near the crest of Pehtei Peninsula. The pilot and one passenger were fatally injured, and two passengers were seriously injured. There was no post-impact fire, and no emergency locator transmitter (ELT) signal was received by the Joint Rescue Coordination Centre or search aircraft.

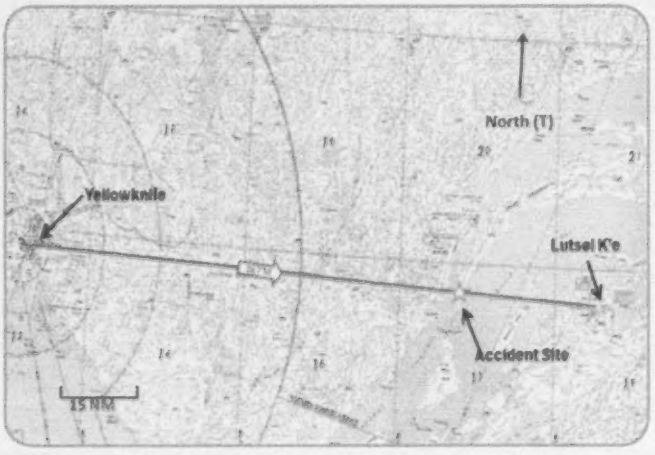
Analysis

When the aircraft departed for Lutsel K'e, the weather at Yellowknife was marginal for VFR flight. Low cloud persisted for the entire flight, which was flown at low level so the pilot could maintain visual contact with the ground. The descent during the last 2 min of the flight suggests that the ceiling had become lower.

The conduct of the flight and the nature of the impact were characteristic of a controlled flight into terrain (CFIT) event. The aircraft struck rising terrain under the pilot's control at cruise speed with a wings-level attitude and a heading generally consistent with the direct track to the destination. Because no effective evasive manoeuvres were made before impact, it is likely that the crest of the Pehtei Peninsula was obscured in fog and not visible to the pilot. The application of increased engine power immediately before impact was likely made when the terrain in front of the aircraft suddenly became visible.

When the pilot transmitted a position report 6 NM closer to Lutsel K'e than the actual position, it is possible that he believed that the shoreline of Great Slave Lake had been crossed and that open water at about 500 ft ASL lay ahead. Since the global positioning system (GPS) was likely the primary navigational aide, there should have been little ambiguity in position, unless the unit was set to a waypoint associated with the area navigation (RNAV) approach at Lutsel K'e. However, the location of the site and the wreckage trail track indicate that the aircraft was proceeding directly to the airport. If an instrument approach had been planned, the aircraft should have been navigating toward a waypoint associated with the approach at an altitude no lower than 3 100 ft, in accordance with the company-published route.

A terrain awareness warning system (TAWS) installation in the aircraft could have warned of the impending collision with the ground, possibly in sufficient time to prevent the accident.



Route and accident site

VFR flight in marginal weather

It could not be determined why the pilot chose to fly the trip under VFR. Conditions were suitable to enable operation under IFR at altitudes providing safe terrain clearance. The pilot, the aircraft and the company were qualified to operate the trip under IFR. The en route weather was suitable. With the freezing level well above the minimum IFR route altitude, icing was not a factor to preclude IFR flight. The cloud base was above the minimums required for successful completion of an approach and landing at Lutsel K'e. Before departure, the forecast weather was such that Yellowknife could be filed as an IFR alternate.

The fuel load was not considered to be a factor in the pilot's decision to fly the trip under VFR rather than IFR. Fuel was readily available at Yellowknife, and there was adequate time between the arrival from Fort Simpson and the departure for Lutsel K'e to bring the fuel quantity to IFR requirements under the supervision of dispatch personnel.

Although the pilot had gained experience in an IFR environment during his flying as a co-pilot in multi-engine aircraft, he had limited experience in single-pilot IFR operations. This may have led to reluctance to file an IFR flight plan on the accident flight, and the decision to remain visual in marginal VFR weather conditions. The route lay mostly in uncontrolled airspace. When flight visibility deteriorated, the pilot had the option of climbing without ATC clearance to a safe altitude and conducting an instrument approach at Lutsel K'e. The pilot was apparently willing to fly in cloud as indicated by the earlier flight from Fort Simpson to Yellowknife, albeit on a VFR flight plan in controlled airspace.

Pilot decision-making and THC effects

On the day of the accident, aspects of the pilot's planning, flying technique and decision-making were inconsistent with regulatory and administrative requirements, the company operations manual policy and safe flying practices. These included VFR flight in marginal visual weather conditions, flight in instrument meteorological conditions (IMC) on a VFR flight plan and overwater flight beyond gliding distance of land. The quantity of psychoactive components in the pilot's system is considered to have been sufficient to have resulted in impairment of cognitive processes. This would likely have had an effect on the planning and conduct of the accident flight. It is possible that the pilot, under the influence of cannabis, avoided the higher workload of IFR flight in IMC, choosing to remain visual for the trip to Lutsel K'e. Random testing of employees in safety-sensitive positions may mitigate this risk.

Overwater flight risk

The company did not provide personal floatation devices in the land-plane fleet, and management expected single-engine aircraft to remain within gliding distance of land at all times. The pilot was familiar with the route. Given the low cloud en route and the current weather at Lutsel K'e, it is likely that a diversion to the south to remain within gliding distance of land would have to be made well before arriving at the shoreline near the accident location. The direct flight track flown toward Lutsel K'e suggests that, after crossing the Pehtei Peninsula, the pilot was prepared to overfly 11 NM of open water at low level, increasing the risk to the aircraft and its occupants. Overflight of Great Slave Lake on the earlier flight from Fort Simpson to Yellowknife indicated a willingness on the part of the pilot to accept that risk.

ELT

Due to a loosely fastened hook and loop retention strap on the ELT installation, the ELT was ejected from its mounting tray during impact. Since instructions do not describe a method for determining the required degree of tightness to retain the ELT in its mount, the installer's own judgment is relied upon to determine this. As a result, a wide variation in the quality of installation of ELTs that are retained by this method could increase the possibility of inadequate retention. In this accident, in the absence of a transmitted 406 MHz signal, the on-board GPS-based flight-following equipment (SkyTrac) was effective in directing the search party to the accident site and reduced the time for the search and rescue of the survivors.

Impact point on Pehtei Peninsula

Findings as to causes and contributing factors

1. The aircraft was flown at low altitude into an area of low forward visibility during a day VFR flight, which prevented the pilot from seeing and avoiding terrain.
2. The concentrations of cannabinoids were sufficient to have caused impairment in pilot performance and decision-making on the accident flight.

Findings as to risk

1. Installation instructions for the ELT did not provide a means of determining the degree of strap tightness necessary to prevent the ELT from being ejected from its mount during an accident. Resultant damages to the ELT and antenna connections could preclude transmission of an effective signal, affecting search and rescue of the aircraft and occupants.

2. Flying beyond gliding distance of land without personal floatation devices on board exposes the occupants to hypothermia and/or drowning in the event of a ditching.

Safety action taken

Transportation Safety Board of Canada (TSB)

On April 19, 2012, the TSB promulgated *Safety Advisory 825-A11W0151-D1-A1, Loose Attachment of Kannad 406 AF-Compact (ER) ELT*, suggesting that Transport Canada may wish to inform owners, operators and maintainers of aircraft with ELTs featuring fabric hook and loop retention systems of the necessity to ensure adequate retention of the ELT in the event of an accident.

Also on April 19, 2012, TSB *Safety Advisory 825-A11W0151-D1-A2* was sent to ELT manufacturers utilizing fabric loop and hook retention systems, advising that they may wish to develop and publish methods of determining the degree of strap tightness and inform maintenance personnel of the necessity of proper installation.

U.S. Federal Aviation Administration (FAA)

On May 23, 2012, the FAA issued *Special Airworthiness Information Bulletin HQ-12-32*, addressed to ELT manufacturers, installers and aircraft maintenance personnel. The bulletin expressed concerns with the ability of hook and loop style fasteners to retain their designed capability to restrain ELTs during accident impact and with the quality of installation instructions to ensure adequate tightness of the fasteners.

Operator

On October 7, 2011, the operator issued a company directive which initiated the following policies for scheduled services operations:

Dispatch limitations:

- All scheduled flights will be dispatched under IFR. VFR flight may only be conducted if authorized by operations management personnel.
- No company aircraft may be operated on any scheduled passenger flight when the observed weather is at, or forecast to be lower than, the alternate minima for the destination airport.

The operator instituted changes to the operational control system of scheduled passenger flights to ensure adequate flight following and timely reporting of departure and arrival times to the company system operations control centre (SOCC).

In order to facilitate incident and accident investigations, the operator has commenced installation of Appareo Vision 1000 Systems cockpit imaging and flight data monitoring devices in the Cessna 208B fleet.

In order to improve operational oversight, the company has consolidated most management personnel at the airport base.

The company has revised the existing drug and alcohol policy to include random testing of employees in safety-sensitive positions. These positions include pilots, maintenance engineers and dispatch personnel.

Kannad Aviation

Kannad Aviation (Orolia Group) has developed a new type of ELT called Integra, which has received European Aviation Safety Agency (EASA), FAA and Transport/Industry Canada certification. The ELT is equipped with an internal integral antenna. When circuits detect a low standing wave ratio due to a lost connection with the external antenna, as in this occurrence, the ELT automatically switches to the internal antenna. To enhance accuracy in position detection, the Integra ELT is also equipped with an internal GPS antenna and receiver.

On June 12, 2012, Kannad Aviation (Orolia Group) issued *Service Bulletin S1800000-25-04* that outlines the instructions for properly securing the ELT during installation and reinstallation and the instructions for inspecting fasteners of mounting brackets. It also defines the replacement interval for the mounting bracket fasteners.

On February 11, 2013, Kannad Aviation issued *Service Bulletin SB1840501-25-25-05 Rev01*, entitled "Kannad 406 AF-Compact, Kannad 406 AF-Compact (ER) Integra ELTs Family - Guidelines for Periodic Inspection". On February 19, 2013, Kannad Aviation issued *Safety Letter SL18XX502-25-12 Rev02*, entitled "Kannad 406 ELTs – Guidelines for Periodic Inspection". These documents describe usual operations for periodic checks required by major aviation authorities.

Transport Canada

An article highlighting the importance of following the manufacturer's installation and retention requirements for ELT installations featuring hook and loop retention systems is included in the "Maintenance and Certification" section of this issue of the *Aviation Safety Letter*.

Note: *The following accident synopses are Transportation Safety Board of Canada (TSB) Class 5 events, which occurred between August 1, 2012, and October 31, 2012. These occurrences do not meet the criteria of classes 1 through 4, and are recorded by the TSB for possible safety analysis, statistical reporting, or archival purposes. The narratives may have been updated by the TSB since publication. For more information on any individual event, please contact the TSB.*

— On August 4, 2012, the pilot of an Aeronca 7ACX was trying to start the engine by hand-propping the propeller at Prince Albert (Glass Field) Airport (CYPA), Sask. The engine started and increased in rpm; the aircraft moved forward. The pilot ran around the wing strut, jumped into the aircraft and pulled back the throttle lever. The aircraft struck a tractor parked in the vicinity and was substantially damaged. The pilot was partially in the aircraft and not secured by seat belts or a shoulder harness. The pilot struck the door post and suffered serious injuries. The aircraft had been tied down at the wing struts but heavy rains in the area made the ground soft, and the ground tie-downs had detached. The parking brake was set but did not hold. *TSB File A12C0104.*

— On August 5, 2012, the pilot of a Schweizer 269C-1 helicopter, with one passenger on board, was at an altitude of about 2 550 ft ASL and on approach to land at Widgeon Lake, B.C. when directional control was lost. The outside air temperature (OAT) was about 25°C. The helicopter rotated around its mast several times and descended into the water about 50 m from the shoreline. Both occupants egressed the sinking helicopter and swam to shore. They were evacuated to Vancouver Harbour by a floatplane and met by an ambulance. They did not require medical attention. The aircraft sank. *TSB File A12P0121.*

— On August 5, 2012, a float-equipped Cessna U206G began its takeoff run on Pelican Lake, Ont., with a pilot and four passengers on board. During takeoff from the water, the aircraft rolled to the left and the left wing clipped the water. The aircraft came to rest in an inverted position submerged in water. The pilot and four passengers evacuated the aircraft with minor injuries, but the aircraft was substantially damaged. The operator immediately responded and picked up the occupants by boat. Wind was reported as coming from a 280° angle at 10 kt, gusting to 20 kt. *TSB File A12C0102.*

— On August 6, 2012, a Cessna C-172 with one pilot and three passengers on board departed Salmon Arm Airport, B.C., on a flight to Victoria, B.C., with a stop in Pitt Meadows, B.C. Shortly after takeoff, the pilot flew along Shuswap Lake before force-landing in a field near a campground in Sicamous, B.C. During the landing roll, the aircraft nosed over. The occupants suffered minor injuries. The Salmon Arm Airport is 1 751 ft ASL, which is a higher elevation than Shuswap Lake and the field where the forced landing took place. The outside air temperature was estimated at about 25°C. The aircraft flight plan indicated 5 hr of fuel endurance. *TSB File A12P0122.*

— On August 6, 2012, an amateur-built Murphy Rebel SR2500 was on the takeoff roll from a 75 ft-wide and 1 500 ft-long grass and gravel airstrip at the Sheslay River Airstrip, B.C. There was a strong cross wind. The aircraft swerved to the left and came to rest in trees bordering the runway. The rescue coordination center received an emergency locator transmitter (ELT) signal and sent a helicopter to pick up the pilot. There were no injuries. The aircraft was substantially damaged. *TSB File A12P0120.*

— On August 8, 2012, an Aerospatiale AS350 B-2 helicopter had conducted two orbits of the landing zone 15 NM south of Norman Wells, N.W.T., before commencing an approach to landing. At about 20 ft above the ground, the helicopter struck some trees on the left hand side. The aircraft landed and came to rest upright. However, the rotor blades and tail boom were substantially damaged. The pilot and three passengers were not injured. The Trenton rescue coordination centre (TR RCC) reported an emergency locator transmitter (ELT) signal. *TSB File A12W0107.*

— On August 13, 2012, the pilot of a Cessna 150M aircraft was attempting to take off from a private grass strip 7 NM south of St. Catharines/Niagara District Airport (CYSN), Ont., and found that the aircraft would not climb. The pilot realized that the flaps were fully down and that the aircraft would not be able to clear the trees at the end of the runway, so he attempted to land on the remaining runway. The aircraft landed hard, collapsing both the left main gear and the nose gear. The aircraft came to rest upright with substantial damage to the wings, landing gear and fuselage. The pilot and the passenger sustained minor injuries. *TSB File A12O0131.*

— On August 17, 2012, an Aerostar (RX-8) balloon was on a commercial flight, as part of the hot air balloon festival, from Hydro-Québec Park to Saint-Jean-sur-Richelieu, Que. with three people on board. While the balloon was making its approach to a field located 1 NM south of Saint-Mathieu-de-Beloeil Airport (CSB3), Que., it started a rapid descent and made a hard landing. The pilot was severely injured and the basket was slightly damaged. *TSB File A12Q0139.*

— On August 17, 2012, a Fantasy Sky Promotions (Fantasy 8-90) balloon was on a privately operated flight, as part of the hot air balloon festival, from the Fort Saint-Jean Campus in Saint-Jean-sur-Richelieu, Que. with four people on board. While the balloon was making its approach to a field in Marieville, Que., it started a rapid descent and made a hard landing. A passenger was thrown from the basket and seriously injured on impact. The balloon was not damaged. *TSB File A12Q0140.*

— On August 19, 2012, the pilot of an unregistered Aeroquest Elan weight-shift basic ultralight departed from his home strip about 8 NM north of Lloydminster, Alta., for a local flight. He was not heard from that evening, so a search was started the next morning. The aircraft was found to have crashed in a ravine near the pilot's home. He was fatally injured. The pilot, who had recently purchased the ultralight and had taken possession that day, was conducting takeoffs and landings. Two TSB investigators were dispatched to the scene. *TSB File A12W0117.*

— On August 20, 2012, the pilot and the passenger of a Piper PA-28-140 were returning to Altona, Man., from Steinbach, Man., on a pleasure flight. On approach to the Altona Municipal Airport, the pilot noticed a vehicle parked on the runway with its lights flashing. The vehicle operator had been conducting a sweep of the runway for debris following a local car racing event. The operator had inadvertently locked the keys in the truck while outside the vehicle, thereby disabling it on the runway. The pilot overflew the airstrip and elected to land on an adjacent 2 000-ft grass strip. There was no wind, the outside temperature was high and the aircraft was landing into the setting sun. The aircraft touched down approximately ½ way down the strip at a high speed. The pilot immediately applied brakes but was unable to stop the aircraft before it overran the end of the runway. The aircraft entered a drainage ditch causing damage to the nose gear, engine cowling and propeller. The pilot came forward into the instrument panel and was injured. The passenger was not injured. The local RCMP and ambulance services responded and transported the pilot and the passenger to hospital for observation. *TSB File A12C0112.*

— On August 23, 2012, a Robinson R44 helicopter and a Robinson R44 II helicopter, both privately operated, were parked near each other at Chicoutimi/Saint-Honoré Airport (CYRC), Que. One of the aircraft was preparing to take off when the engine of the other aircraft started. The rotors of the two aircraft made contact and caused damage to the main rotor blades, but there did not seem to be any debris. Nobody was injured. The main rotor blades were removed from both helicopters and sent to the manufacturer in order to determine whether they could be repaired or whether they needed to be replaced. *TSB File A12Q0153.*

— On August 26, 2012, the pilot of a Luscombe 8AX at Lachute Airport (CSE4), Que. was starting the engine by hand because the aircraft was not equipped with a starter. Since nobody was around to help the pilot with start-up, the tailwheel had been attached to an anchor point with a nylon strap. After start-up, the strap broke and the aircraft began to move toward another aircraft. In order to avoid a collision, the pilot held onto the left wing strut. The aircraft came to a stop in a ditch, and the propeller and right wing tip were damaged. Nobody was injured. *TSB File A12Q0147.*

— On August 26, 2012, an amateur-built, float-equipped Glastar aircraft was departing from Stoney Lake, Ont. During the takeoff run, the pilot rotated the aircraft off the water earlier than usual to avoid boat traffic. The aircraft settled back onto the water with the left wing low and in a nose down attitude. Subsequently, the left float dug in and the aircraft spun around on the water. The aircraft came to rest upright. The occupants exited the aircraft before it capsized and were assisted by boaters. There were no injuries, but the aircraft was substantially damaged. *TSB File A12O0140.*

— On September 5, 2012, a private Cessna 172 with four adults on board and about ⅓ fuel capacity attempted to take off from a grass strip at the east end of Canim Lake, B.C. The aircraft became airborne but settled, and takeoff was aborted. The aircraft ran off the end of the strip into two ft of water and flipped over. The emergency locator transmitter (ELT) activated. There were no injuries. *TSB File A12P0146.*

— On September 5, 2012, a privately owned Cessna A188B (Ag Truck) departed from a field near Jarvie, Alta. in still air conditions. Shortly after takeoff, the aircraft struck power lines and then collided with flat terrain and nosed over. The aircraft was substantially damaged, and the pilot sustained serious injuries. The pilot was wearing a five-point harness, a flight helmet and respirator. *TSB File A12W0123.*

— On September 9, 2012, a private Piper PA-24-250 Comanche flew from Maple Creek, Sask., to Saskatoon, Sask., to drop off a passenger and then flew back to Maple Creek without refueling. On arrival at Maple Creek, the pilot decided to divert to Swift Current, Sask., because of thunderstorm activity. In the turbulence, the cabin door popped open and the pilot's glasses got lost. The pilot had difficulty reading and setting radio frequencies. The pilot arrived in the vicinity of the Swift Current Airport but was unable to activate the aircraft radio control of aerodrome lighting (ARCAL) at Swift Current Airport. Several agencies and other pilots in the vicinity attempted unsuccessfully to assist, but fuel was eventually exhausted. A forced landing was made into a field about 5 mi. east of Swift Current Airport. The pilot reportedly sustained minor injuries, and the aircraft was substantially damaged. *TSB File A12C0125.*

— On September 14, 2012, a privately owned Piper PA-20X, with two people on board, was conducting high-speed taxiing exercises on Taxiway Delta at Bagotville Airport (CYBG), Que. While the pilot was putting the tailwheel on the ground, the aircraft veered slightly to the left, and then hard to the right and ground-looped. The aircraft ended up on the edge of Taxiway Delta. The left wheel collapsed; the left wing hit the grass and was bent. There was a small fuel leak. The two people on board were not injured. *TSB File A12Q0166.*

— On September 16, 2012, a privately owned Cessna 414A was on an IFR flight from Kuujjuaq (CYVP), Que. to Schefferville (CYKL), Que. While landing, the aircraft touched down at high speed on the wet runway. The crew was not able to stop the aircraft, which ended up in a ditch at the end of Runway 18. During the runway overrun, all the landing gears collapsed. Nobody was injured. At 20:51 GMT, 11 min after the accident, the automated weather observation system (AWOS) issued a ceiling of 300 ft with visibility of 1¾ mi. in light rain and mist. *TSB File A12Q0167.*

— On September 17, 2012, a Robinson R44 helicopter landed in dry grass at a remote gas plant site. Near the end of the 2 min cool down, as the pilot was about to disengage the drive engagement clutch prior to engine shutdown, the engine (Avco Lycoming O-540-F1B5) stopped. The pilot opened the door and observed a grass fire at the rear of the helicopter, below the engine. The pilot attempted to extinguish the fire using the cabin fire extinguisher and water bottles, but the fire spread to the engine compartment. Within 3 min, the helicopter was completely consumed by flames. The helicopter was destroyed; the pilot was not injured. The ground in the vicinity of the landing site was covered with tall, dry grass. In an area measuring approximately 12 ft in diameter, the grass had been cut using a hand-held weed whacker in order to provide a suitable touchdown spot. The helicopter was fitted with a D318-1 shield installation, in accordance with *Robinson R44 Service Bulletin SB-46.* This installation provides shields below the exhaust collectors and tailpipe to reduce the chance of grass fire. Section 10 of the *R44 Pilot's Operating Handbook* contains a safety tip that advises against landing in tall, dry grass, as the exhaust is low to the ground and very hot, and a grass fire may be ignited. *TSB File A12W0131.*

— On September 19, 2012, a Bell 206B helicopter landed on the shoreline of Oldman River, about 5 NM east of Cowley, Alta., with a pilot and one passenger on board, in order to access a fly fishing site. Following departure from the site, the helicopter flew into an unmarked single-wire power cable that spanned the river, approximately ¼ mi. from the landing site. A section of the No. 2 gauge cable wrapped around the mast and pitch links, resulting in a loss of control. A forced landing was carried out in a field immediately adjacent to the river. The helicopter struck the ground twice before coming to rest in a partially upright position. It was substantially damaged. The pilot sustained minor injuries, and the passenger was uninjured. The downed power cable ignited a grass fire which spread across a large section of the field. Good VFR weather conditions existed at the time of the occurrence. The pilot had flown into the area in the past but was unaware of the cable. The helicopter was not fitted with a wire strike protection kit. The power pole that supported the cable was marked with red and white stripes on one end of its span, but the opposite pole was obscured by trees. The power cable has been replaced and is now marked with two white cones on the section above the river. *TSB File A12W0133.*

— On September 23, 2012, a Boeing Vertol BV107-II helicopter was grapple logging about 23 NM west of Bella Coola, B.C. The grapple grabbed two logs, and the helicopter began to lift the load and fly it off the hill. As the logs were becoming airborne, the grapple began to slip and the load was deemed too heavy. As a result, the crew released the load. Unfortunately, one of the falling logs hit a worker on the ground, causing fatal injuries. *TSB File A12P0161.*

— On September 25, 2012, an unregistered amphibious Ramphos S ultralight was on a VFR flight from Joliette Airport (CSG3), Que. Shortly after the crosswind takeoff, the aircraft crashed. The pilot sustained minor injuries and was taken to hospital. The aircraft's right wing was substantially damaged. *TSB File A12Q0176.*

— On September 26, 2012, a float-equipped Cessna 185 was arriving at Ocean Falls, B.C., from Coal Harbour, B.C., with four persons on board. On short final, the pilot was advised that they were landing at the wrong dock. The pilot performed an overshoot and flew straight ahead at low altitude to the next dock about 1 NM away. Upon approaching the second dock, the pilot was advised that the first dock had been the correct one. The pilot then executed a left turn at low altitude. The aircraft lost speed and collided with the water on the aircraft's left side. The aircraft was substantially damaged, but it remained upright and did not sink. There were no injuries to the persons on board, all of whom were wearing personal floatation devices. They evacuated onto a rescue boat. The weather was clear with unlimited visibility, winds were light and variable, and manoeuvring room was unrestricted. *TSB File A12P0165.*

— On September 27, 2012, a Bell 206-L4 helicopter took off from a road located between the guy lines, about 150 ft from the Dubray transmission tower, which is located approximately 117 NM northeast of Chibougamau, Que. The tower had three guy lines attached at three different heights. During takeoff, the main rotor struck a guy line about 30 ft from the ground. The aircraft landed without further incident. The guy line was cut. The tips of both main

rotor blades were substantially damaged. None of the three occupants were injured. The guy line bases were marked. *TSB File A12Q0178.*

— On September 28, 2012, the owner of a Denney Kitfox IV aircraft was conducting taxi runs on a private runway with the recently purchased aircraft. On the final taxi run, the aircraft became airborne near trees at the end of the runway. The aircraft climbed steeply then banked sharply to the right before power was reduced, and the aircraft pitched nose down. The aircraft entered the tree canopy almost vertically before impacting the ground. The owner, the sole occupant, sustained serious injuries, and the aircraft was substantially damaged. *TSB File A12A0097.*

— On October 1, 2012, the pilot of a Bell 206B helicopter was conducting dust control spray application in the Sudbury, Ont. area. While coming out of a turn to conduct another swath application, the helicopter lost altitude and collided with the ground. The helicopter was substantially damaged, and the pilot sustained minor injuries. *TSB File A12O0162.*

— On October 2, 2012, the pilot of a Lake LA-4-200 amphibious aircraft was conducting touch-and-go landings on the Ottawa River near Cumberland, Ont. On the first landing, the pilot encountered glassy water conditions and the aircraft touched down hard, buckling the fuselage. The aircraft sank rapidly, but the pilot was able to evacuate the aircraft and was rescued by a nearby boat. The pilot was wearing his shoulder strap and an inflatable life jacket at the time of the accident. *TSB File A12O0169.*

— On October 15, 2012, a float-equipped Cessna 172 overturned while taking off on a training flight from Pitt Lake, B.C. with an instructor and student on board. The student was able to escape the aircraft with minor injuries, but the instructor lost consciousness. Attempts by the student to extract the instructor were unsuccessful. The student pilot was rescued by a passing boat before Search and Rescue (SAR) arrived on scene. Rescue divers later recovered the deceased instructor from the aircraft. The aircraft was substantially damaged. *TSB File A12P0179.*

— On October 26, 2012, a Bushmaster Super 22 advanced ultralight was on a VFR flight in the Low, Que. area. The aircraft had experienced engine problems (Rotax 582) the week before the flight. The pilot had been forced to make an emergency landing in a field next to his runway, not far from his home. Following usage checks and a ground test, the pilot took off from the field and headed towards his runway. During the flight, the engine (Hirth Motoren K-G Reciprocating) sputtered again and then stopped completely. The pilot was not able to restart the engine and, as a result, he was unable to reach the runway. He crashed in a wooded area. The pilot was taken to hospital as a precaution. The aircraft was substantially damaged. As the aircraft was being recovered, it caught fire and became engulfed in flames. *TSB File A12Q0189.* △

Looking for *AIP Canada (ICAO)* Supplements and Aeronautical Information Circulars (AIC)?

As a reminder to all pilots and operators, *AIP Canada (ICAO)* supplements and AICs are found online on the NAV CANADA Web site (www.navcanada.ca). Pilots and operators are strongly encouraged to stay up to date with these documents by visiting the NAV CANADA Web site at the following link: Aeronautical Information Products.

Twelve Operational Pitfalls for Helicopter Pilots

by the International Helicopter Safety Team (IHST)

Pilots, particularly those with considerable experience, try to complete a flight as planned, please passengers, meet schedules and generally demonstrate the "right stuff". This basic drive can have an adverse effect on safety and can impose an unrealistic assessment of piloting skills under stressful situations. Even worse, repetitive patterns of behaviour based on unrealistic assessments can produce piloting practices that are dangerous, often illegal, and will ultimately lead to mishaps. Here are 12 of these possibly dangerous tendencies or behaviour patterns:

- **Responding to Peer Pressure** - This is poor decision making based upon emotional responses to peers rather than evaluating a situation objectively.
- **Mental Expectancy** - The inability to recognize and cope with changes in a situation different from those anticipated or planned. Visual illusions and similar aural sounds occurring at the "wrong" time often lead to such miscues.
- **Get-There-Itis** - This "disease", common among pilots, clouds the vision and impairs judgment by causing a fixation on the original goal or destination combined with a total disregard for any alternative courses of action.
- **Duck-Under Syndrome** - The tendency to "sneak a peek" by descending below minimums during an approach. Based on a belief that there is always a built-in "fudge" factor that can be used or on an unwillingness to admit defeat and shoot a missed approach.
- **Scud Running** - Pushing the capabilities of the pilot and the aircraft to the limits by trying to maintain visual contact with the terrain while trying to avoid physical contact with it.
- **Continuing Visual Flight Rules into Instrument Conditions** - The all-too-often result of the above-mentioned practice of scud running when this becomes the only alternative to flying into the ground. It is even more dangerous if the pilot is not instrument qualified or is unwilling to believe what the gauges are indicating.
- **Getting Behind the Aircraft** - Allowing events or the situation to control your actions rather than the other way around. This is characterized by a constant state of surprise at what happens next.
- **Loss of Positional/Situational Awareness** - Another case of "getting behind the aircraft" which results in not knowing where you are, and an inability to recognize deteriorating circumstances and/or the misjudgment of the rate of deterioration.
- **Operating Without Adequate Fuel Reserves** - Ignoring minimum fuel reserve requirements under either VFR or IFR. This is generally the result of overconfidence, a lack of flight planning, or deliberately ignoring the regulations.
- **Descent Below the Minimum En Route Altitude** - The duck-under syndrome (mentioned earlier) manifesting itself during the en route portion of an IFR operation.
- **Flying Outside the Envelope** - Unjustified reliance on the (usually mistaken) belief that the aircraft's high performance capabilities meet the demands imposed by the pilot's (usually overestimated) high performance flying skills.
- **Neglect of Flight Planning, Preflight Inspections, Checklists, Etc.** - Unjustified reliance on the pilot's (usually overestimated) short- and long-term memory of regular flying skills, of repetitive and familiar routes, etc.

All experienced pilots have fallen prey to, or have been tempted by, one or more of these 12 dangerous tendencies at some time in their flying careers. Hopefully, they are natural mistakes that can be easily recognized for what they are and quickly avoided.

The **International Helicopter Safety Team (IHST)** promotes safety and works to reduce accidents. The organization was formed in 2005 to lead a government and industry cooperative effort to address factors that were affecting an unacceptable helicopter accident rate. The group's mission is to reduce the international civil helicopter accident rate by 80 percent by 2016.

While written by and for helicopter pilots, this article applies equally well to pilots of all stripes. For information on the IHST, visit www.IHST.org. △

TP 11554E
(04/2013)

Spark Plug Installation Safety Tips

- A torque wrench should be used to apply the recommended torque.
- To avoid plug damage, always use a **six-point socket**.
- Never install a spark plug that has been dropped.
- To change polarity and **equalize the firing wear**, rotate spark plugs between even- and odd-numbered cylinders, or as specified by the engine manufacturer.
- Inspect plug connector well for proper internal sealing and evidence of gas leaks or flashover. Clean thoroughly the connector well, ignition harness connector terminal and seal grommet prior to installation.
- Inspect and clean the plug threads with a wire brush as necessary.
- Do **not** use a wire brush to clean electrodes.
- Check and close the ground electrode gap to the specified setting by applying pressure with the correct tool. **Do not attempt to open gaps that are set too close.**
- Apply a **very small amount of anti-seize compound** near the firing end of the plugs threads, but never to the first thread. To avoid a build-up of excess compound, consider this application for every third reinstallation after cleaning old plugs and for initial installation of new plugs.
- Use **one** new or annealed (if flat copper type) washer per plug.
- Do **not** add a washer where a thermocouple is installed.

Canada

TAKE FIVE...

TP 2228E-1
(05/2013)

for safety

Five minutes reading could save your life!

178 seconds

If you're ever tempted to take off in marginal weather and have no instrument training, read this article first before you go. If you decide to go anyway and lose visual contact, *start counting down from 178 seconds.*

How long can a pilot who has no instrument training expect to live after he flies into bad weather and loses visual contact? Researchers at the University of Illinois found the answer to this question. Twenty students "guinea pigs" flew into simulated instrument weather, and all went into graveyard spirals or rollercoasters. The outcome differed in only one respect; the time required until control was lost. The interval ranged from 480 seconds to 20 seconds. The average time was 178 seconds—two seconds short of three minutes.

Here's the fatal scenario...

The sky is overcast and the visibility poor. That reported 5-mile visibility looks more like two, and you can't judge the height of the overcast. Your altimeter says you're at 1 500 feet but your map tells you there's local terrain as high as 1 200 feet. There might even be a tower nearby because you're not sure just how far off course you are. But you've flown into worse weather than this, so you press on.

You find yourself unconsciously easing back just a bit on the controls to clear those none-too-imaginary towers. With no warning, you're in the soup. You peer so hard into the milky white mist that your eyes hurt. You fight the feeling in your stomach. You swallow, only to find your mouth dry. Now you realize you should have waited for better weather.

The appointment was important—but not that important. Somewhere, a voice is saying "You've had it—it's all over!".

You now have 178 seconds to live. Your aircraft feels in an even keel but your compass turns slowly. You push a little rudder and add a little pressure on the controls to stop the turn but this feels unnatural and you return the controls to their original position. This feels better but your compass is now turning a little faster and your airspeed is increasing slightly. You scan your instrument panel for help but what you see looks somewhat unfamiliar. You're sure this is just a bad spot. You'll break out in a few minutes. (But you don't have several minutes left...)

You now have 100 seconds to live. You glance at your altimeter and are shocked to see it unwinding. You're already down to 1 200 feet. Instinctively, you pull back on the controls but the altimeter still unwinds. The engine is into the red—and the airspeed, nearly so.

You have 45 seconds to live. Now you're sweating and shaking. There must be something wrong with the controls; pulling back only moves that airspeed indicator further into the red. You can hear the wind tearing at the aircraft.

You have 10 seconds to live. Suddenly, you see the ground. The trees rush up at you. You can see the horizon if you turn your head far enough but it's at an unusual angle—you're almost inverted. You open your mouth to scream but...

...you have no seconds left.

To view the complete *Take Five* list, please click **here**.